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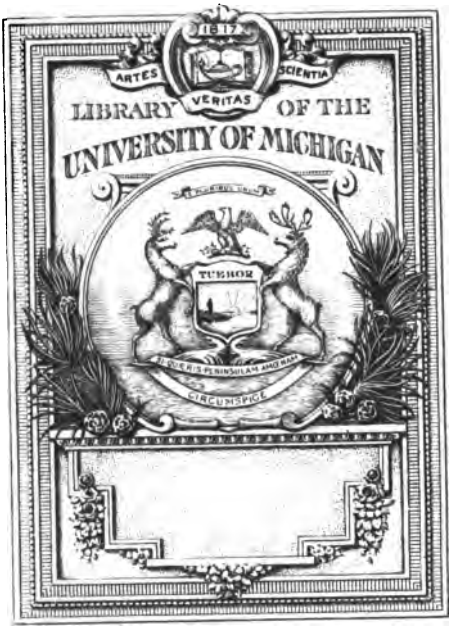

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REFLECTIONS UPON *Ancient* and *Modern* LEARNING.

By *WILLIAM WOTTON*, B. D.
Chaplain to the Right Honourable the EARL of *NOTTINGHAM.*

LONDON,
Printed by *J. Leake*, for *Peter Buck*, at the Sign of the *Temple*, near the *Inner-Temple*-Gate, in *Fleet-street*, MDCXCIV.

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TO THE
Right Honourable
DANIEL
Earl of NOTTINGHAM,
Baron FINCH of DAVENTRY.

May it pleaſe Your Lordſhip,

SInce I am, upon many Accounts, obliged to lay the Studies and Labours of my Life at Your Lordſhip's Feet, it will not, I hope, be thought Preſumption in me to make this following Addreſs, which, on my Part, is an Act of Duty.

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I could not omit ſo fair an Opportunity of declaring how ſenſible I am of the Honour of being under Your Lordſhip's Patronage. The Pleaſure of telling the World that one is raiſed by Men who are truly Great and Good, works too powerfully to be ſmothered in the Breaſt of him that feels it; eſpecially ſince a Man is rarely cenſured for ſhewing it, but is rather commended for gratifying ſuch an Inclination, when he thankfully publiſhes to whom he is indebted for all the Comforts and Felicities of his Life.

But Your Lordſhip has another Right to theſe Papers, which is equal to that of their being

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being mine: The Matter it ſelf directs me to Your Lordſhip as the proper Patron of the Cauſe, as well as of its Advocate. Thoſe that enquire whether there is ſuch a Spirit now in the World as animated the greateſt Examples of Antiquity, muſt ſeek for living Inſtances, as well as abſtracted Arguments; and thoſe they muſt take care to produce to the beſt Advantage, if they expect to convince the World that they have found what they ſought for.

This therefore being the Subject of this following Enquiry, it ſeemed neceſſary to urge the ſtrongeſt Arguments

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first, and to prepossess the World in favour of my Cause, by this Dedication. For those that consider that the Vertues which make up a great Character, such as Magnanimity, Capacity for the highest Employments, Depth of Judgment, Sagacity, Elocution, and Fidelity, are united in as eminent a Degree in Your Lordship, as they are found asunder in the true Characters of the Ancient Worthies; that all this is rendred yet more Illustrious by Your Exemplary Piety and Concern for the Church of England, *and Your Zeal for the Rights and Honour of the* English *Monarchy; and last*

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last of all, that these Vertues do so constantly descend from Father to Son in Your Lordship's Family, that its Collateral Branches are esteemed Publick Blessings to their Age and Country; will readily confess that the World does still improve, and will go no further than Your Lordship, to silence all that shall be so hardy as to dispute it.

Justice therefore, as well as Gratitude, oblige me to present these Papers to Your Lordship: Though, since I have taken the Freedom, in several Particulars, to dissent from a Gentleman, whose Writings have been very kindly received

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in the World, I am bound to declare, that the chief Reaſon of this Addreſs was, to let the World ſee, that I have a Right to ſubſcribe my ſelf,

May it pleaſe Your Lordſhip,

Your Lordſhip's

Moſt Obliged,

And Moſt Dutiful

Servant and Chaplain,

WILLIAM WOTTON.

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PREFACE.

THE Argument of these following Papers seems, in a great Measure, to be so very remote from that holy Profession, and from those Studies, to which I am, in a more particular Manner, obliged to dedicate my self, that it may, perhaps, be expected that I should give some Account of the Reasons which engaged me to set about it.

In the first Place therefore, I imagined, that if the several Boundaries of *Ancient and Modern Learning* were once impartially stated, Men would better know what were still unfinished, and what were, in a manner, perfect; and consequently, what deserved the greatest Application, upon the Score of its being

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being imperfect: Which might be a good Inducement to ſet thoſe Men, who, having a great Genius, find alſo in themſelves an Inclination to promote Learning, upon Subjects wherein they might, probably, meet with Succeſs anſwerable to their Endeavours: By which Means, Knowledge, in all its Parts, might at laſt be compleated. I believed likewiſe, that this might inſenſibly lead Men to follow ſuch, and only ſuch, for their Guides, as they could confide in for the ableſt and beſt in thoſe ſeveral Kinds of Learning to which they intended to apply their Thoughts. He that believes the Ancient *Greeks* and *Romans* to have been the greateſt Maſters of *the Art of Writing* that have ever yet appeared, will read them as his Inſtructors, will copy after them, will ſtrive to imitate their Beauties, and form his Stile after their Models,

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Models, if he propoſes to himſelf to be excellent in that Art himſelf: All which Things will be neglected, and he will content himſelf to read them in their Tranſlations, to furniſh his Mind with Topicks of Diſcourſe, and to have a general Notion of what theſe Ancient Authors ſay, if he thinks he may be equally excellent a nearer Way. To read *Greek* and *Latin* with Eaſe, is a Thing not ſoon learnt: The Languages are too much out of the common Road; and the Turn which the *Greeks* and *Latins* gave to all their Thoughts, cannot be reſembled by what we ordinarily meet with in Modern Languages; which makes them tedious, till maſtered by Uſe. So that conſtant Reading of the moſt perfect Modern Books, which does not go jointly on with the Ancients, in their Turns, will, by bringing the Ancients into Diſ-uſe, cauſe the Learning

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Learning of the next Generation to ſink; by reaſon that they, not drawing from thoſe Springs from whence theſe excellent Moderns drew, whom they only propoſe to follow, nor taking thoſe Meaſures which theſe Men took, muſt, for want of that Foundation which theſe their Modern Guides firſt carefully laid, fail in no long Compaſs of Time.

Yet, on the other Hand, if Men who are unacquainted with theſe Things, ſhould find every Thing to be commended becauſe it is *oldeſt*, not becauſe it is *beſt*; and afterwards ſhould perceive that in many material and very curious Parts of Learning, the Ancients were, comparatively ſpeaking, groſly ignorant, it would make them ſuſpect that in all other Things alſo they were equally deficient; grounding their general Concluſion upon this very common, though erroneous, Principle,

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Principle, that becauſe a Man is in an Errour in thoſe Things whereof we can judge, therefore he muſt be equally miſtaken in thoſe Things where we cannot. Now, this Extream can be no Way more eaſily avoided, than by ſtating the due Limits of Ancient and Modern Learning; and ſhewing, in every Particular, to which we ought to give the Pre-eminence.

But I had another, and a more powerful Reaſon, to move me to conſider this Subject; and that was, that I did believe it might be ſome way ſubſervient to Religion it ſelf. Among all the Hypotheſes of thoſe who would deſtroy our moſt holy Faith, none is ſo plauſible as that of the *Eternity of the World.* The fabulous Hiſtories of the *Egyptians*, *Chaldeans* and *Chineſes* ſeem to countenance that Aſſertion. The ſeeming Eaſineſs of ſolving all Difficulties that occurr, by pretending that

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that ſweeping Floods, or general and ſucceſſive Invaſions of Barbarous Enemies, may have, by Turns, deſtroyed all the Records of the World, till within theſe laſt Five or Six Thouſand Years, makes it very amiable to thoſe whoſe Intereſt it is, that the *Chriſtian Religion* ſhould be but an empty Form of Words, and yet cannot ſwallow the *Epicurean* Whimſies of Chance and Accident. Now the Notion of the Eternity of Mankind, through infinite ſucceſſive Generations of Men, cannot be at once more effectually and more popularly confuted, than by ſhewing how the World has gone on, from Age to Age, improving; and conſequently, that it is at preſent much more knowing than it ever was ſince the earlieſt Times to which Hiſtory can carry us.

But upon Examination of this Queſtion, ſeveral Difficulties appeared,

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peared, which were carefully to be removed. The greateſt was, That ſome Sciences and Arts, of a very compounded Nature, ſeem really to have been more perfect anciently than they are at preſent; which did, as it were, directly overthrow my Poſition. Therefore I was obliged, firſt, to enquire whether the Thing were true in Fact, or not: Next, If true, whether it proceeded from a particular Force of Genius, or from the Concurrence of ſome accidental Circumſtances; and alſo, whether, in Caſe ſuch Circumſtances did concurr, in other Things, where thoſe Accidents could have no Place, the Moderns did not out-do the Ancients ſo much, as, allowing the World to be no older than the *Moſaical* Account, it was reaſonably to be expected that they ſhould. For then, if all theſe Queſtions could be ſatisfactorily reſolved, the Objection would

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would be no Objection at all; and Mankind might ſtill be ſuppoſed to improve, even though in ſome Particulars they ſhould go back, and fall ſhort of the Perfection which once they had.

There is no Queſtion but theſe Excellencies of the Ancients might be accounted for, without hurting the Account given by *Moſes*, by reſolving them into a particular Force of Genius, evidently diſcernable in former Ages, but extinct long ſince. But this ſeemed to be of very ill Conſequence, ſince it did, as it were, ſuppoſe that Nature were now worn out, and ſpent; and ſo might tempt a *Libertine* to think that Men, like Muſhrooms, ſprung out of the Earth when it was freſh and vigorous, impregnated with proper Seminal Atoms, now, of many Ages, no longer ſeen.

When nothing therefore ſeemed ſo likely to take off the Force of the

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the main Objection, as the finding of particular Circumſtances which might ſuit with thoſe Ages that did exceed ours, and with thoſe Things wherein they did exceed them, and with no other Age nor Thing beſides; I did at laſt pleaſe my ſelf, that I had found theſe Circumſtances; and in ſetting them down, I took Care, neither to be deceived my ſelf, nor (as I hope) to deceive any Body elſe.

But what ſhall be ſaid to thoſe numerous Deluges, which, no Body knows how many Ages before that of *Noah*, or before one another, are ſaid to have carried away all Mankind, except here and there a Couple of ignorant Salvages, who got to ſome high Mountain, and from thence afterwards repleniſhed the Earth? This Hypotheſis (as theſe Men call it) is ſo very precarious, that there needs nothing to be replied, but only that it is as

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eaſily diſ-proved by denying, as affirmed by aſſerting, ſince no Records nor Traditions of the Memory of the Facts are pretended; and ſomething eaſier, becauſe it may be demonſtrably proved, that a general Flood cannot be effected without a Miracle. Now, partial Deluges are not ſufficient: If one Country be deſtroyed, another is preſerved; and if the People of that Country have Learning among them, they will alſo have a Tradition, that it once was in the other Countries too, which are now diſ-peopled.

Upwards of the Age of *Hippocrates*, Knowledge may be traced to its ſeveral Sources: But of any great Matters done before *Moſes*, there are no ſort of Foot-ſteps remaining, which do not, by their Contradictions, betray their Falſhood; ſetting thoſe aſide which *Moſes* himſelf has preſerved. There is Reaſon to ſuppoſe that Invaſions of Barbarous Enemies

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Enemies were anciently of the ſame Nature, as they have been ſince; that is, they might poſſibly make entire Conqueſts of the Countries which were ſo invaded; but we cannot ſuppoſe that any of theſe pretended *Ante-Moſaical* Conqueſts, of which we are now ſpeaking, made a greater Alteration than that which the *Goths* and *Vandals* made in the *Roman* Empire; that which the *Saracens* firſt, and the *Turks* afterwards made in the *Greek*; or that of the *Tartars* in *China*. The *Goths* and *Vandals* had no Learning of their own; and if we conſider Politeneſs of Manners, and nothing elſe, they ſeem truly to have deſerved the Name of *Barbarous*: They therefore took ſome of the *Roman* Learning, as much as they thought was for their Turn, the Memory whereof can never be ſaid to have been quite extinct during the whole Courſe of thoſe ignorant

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Ages, which ſucceeded, and were the Effects of their Conqueſts. The *Saxons* in *England*, being taught by the *Britiſh* Refugees, who planted themſelves in *Ireland*, and from thence, by the Way of *Scotland*, came by degrees back again into their own Country, had as much, if not more Learning than any of their *Europæan* Neighbours. The *Saracens* applied themſelves to Learning in earneſt, as ſoon as the Rage of their firſt Wars was over; and reſolving to make theirs a compleat Conqueſt, robbed the *Greeks* of their Knowledge as ſoon as they had poſſeſſed themſelves of the moſt valuable Parts of their Empire. The *Turks* learnt enough, not to be thought illiterate, though leſs proportionably than any of the forementioned Conquerors: They can write and read; they preſerve ſome rude Annals of their own Exploits, and general Memorials, it matters not

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not how imperfect, of precedent Times: And they loſe none of the Mechanical Arts which they found in the Countries where they came, ſince they either work themſelves, or employ others that ſhall; which, to the preſent Purpoſe, is all a caſe. The *Tartars* have, ſince their Conqueſt, incorporated themſelves with the *Chineſes*, and are now become one People, only preſerving the Authority ſtill in their own Hands.

In all theſe Inſtances one may obſerve, that how barbarous ſoever theſe ſeveral Conquerors were when firſt they came into a Civilized Country, they, in Time, learnt ſo much at leaſt of the Arts and Sciences of the People whom they had ſubdued, as ſerved them for the neceſſary Uſes of Life; and thought it not beneath them to be inſtructed by thoſe to whom they gave Laws. Wherefore there is Reaſon to believe, that ſince Mankind has always been of

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the ſame Make, former Conqueſts would have produced the ſame Effects, as we ſee later ones have done. In ſhort, We cannot ſay that ever any one Invention of Univerſal Uſe has been laid aſide, unleſs ſome other of greater, and more general Uſe has come in the Room of it, or the Conquerors took it away, for ſome Political Reaſon, either letting it totally die, or ſupplying it with ſomething elſe, which to them ſeemed a valuable Equivalent. Have any of theſe Conquerors, ſince *Tubal-Cain's* Time, once ſuffered the Uſe of Metals, Iron for Inſtance, or Gold, to be loſt in the World? Have Letters been ever loſt, ſince the Time of that firſt *Cadmus*, whoever he was, that found them out? Or was Mankind ever put to the Trouble of inventing them a ſecond Time? Have the Arts of Planting, of Weaving, or of Building, been at any

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any Time intermitted? Does any Man believe that the Uſe of the *Load-Stone* will ever be forgotten? Are the *Turks* ſo barbarous, or ſo ſpightful to themſelves, that they will not uſe Gun-powder, becauſe it was taught them by *Chriſtians*? Does not *Garçilaſſo de la Vega* inform us, that the *Peruvians* would have worſhipped the *Spaniards* as Gods, if their Cruelties had not ſoon led theſe harmleſs People to take them to be ſomething elſe, becauſe they taught them the Uſe of *Iron* and *Looking-Glaſſes*? (Whence we may be ſure that this innocent and honeſt Nation never had Learning amongſt them before.) Do not we find that they and the *Mexicans*, in a Compaſs of Four or Five Hundred Years, which is the utmoſt Period of the Duration of either of their Empires, went on ſtill improving? As the whole *New World* would, probably,

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have done in not many Ages, if these two mighty Nations had extended their Conquests, or if new Empires had arisen, even though the *Spaniards* had never come among them; since those two Empires of *Mexico* and *Peru*, which were the only considerable Civilized Governments in *America*, got constant Ground of their Enemies; having the same Advantages over them, as formed Troops have over a loose Militia. Or can we think that they would again have relapsed to their old Barbarity of themselves, when once they had been weary of those Arts, and of that Learning (such as it was) which then they had? Mankind is not so stupid a Thing, but if they do at any Time find out what may do them great and eminent Service, they will learn it, and make use of it, without enquiring who it is they learn it of, or taking a Prejudice at the Thing, because, perhaps, they

may

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may be indebted to an Enemy for it. *Barbarous* and *Polite* are Words which rather referr to Matters of *Breeding* and *Elegance*, than of *Sound Judgment*, or *Common Sense*; which first shew themselves in making Provision for Things of Convenience, and evident Interest, wherein Men scarce ever commit palpable Mistakes. So that it seems unaccountable that the History of Learning and Arts should be of so confessedly late a Date, if the Things themselves had been very many Ages older; much more if the World had been Eternal.

Besides these, I had a Third Reason to engage me to this Undertaking; which was, the Pleasure and Usefulness of those Studies to which it necessarily led me: For Discoveries are most talked of in the Mechanical Philosophy, which has been but lately revived in the World. Its Professors had drawn in to it the whole Knowledge of Nature, which,

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in an Age wherein Natural Religion is denied by many, and Revealed Religion by very many more, ſeemed highly important to be ſo far known at leaſt, as that the Inviſible Things of the Godhead may be clearly proved by the Things that are ſeen in the World. Wherefore I thought it might be Labour exceeding well ſpent, if, whilſt I enquired into what was anciently known, and what is a new Diſcovery, I ſhould at the ſame Time furniſh my Mind with new Occaſions of admiring the boundleſs Wiſdom and Bounty of that Almighty and Beneficent Eſſence, in and by whom alone this whole Univerſe, with all its Parts, live, and move, and have their Being.

I had alſo a freſh Inducement to this Search, when I found to how excellent purpoſe my moſt learned and worthy Friend, Mr. *Bentley*, has, in his late Diſcourſes

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againſt Atheiſm, ſhewn what admirable Uſe may be made of an accurate Search into Nature, thereby to lead us directly up to its Author, ſo as to leave the unbelieving World without Excuſe.

But, after all that I have alledged for my ſelf, I muſt acknowledge, that I ſoon found that I did not enough conſider *Quid valeant humeri, aut quid ferre recuſent*. The Subject was too vaſt for any one Man, much more for me, to think to do it Juſtice; and therefore, as ſoon as I had drawn up a rude Scheme of the Work, I intended to have given it over, if the importunate Sollicitations of my very ingenious Friend, *Anthony Hammond*, Eſq; had not at laſt prevailed upon me to try what might be ſaid upon it: And it was ſo difficult a Thing to me to refuſe what was ſo earneſtly preſſed by a Perſon who was ſo very dear to me, and which in the preſent Caſe was a great

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great deal more; one, for whose Sence and Judgment, all that know him have so very particular a Regard, that I resolved at last, rather to hazard my own Reputation, than to deny his Request; especially, since I hoped that it might, perhaps, give some Body else an Opportunity to compleat that, of which this Treatise is a very imperfect Essay.

I hope I need make no Apology, that a great Part of this Discourse may seem too Polemical for a Writing of this kind: But that could not be avoided, because the Argument it self has been so much debated. The ableſt Men of the two opposite Parties are, Sir *William Temple*, and Monsieur *Perrault*: They are too great Men, and their Writings are too well known, and too much valued, to be over-looked. They cloath their Thoughts in so engaging a Dress, that a Man is tempted to receive all they say, without

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without Examination; and therefore I was afraid that I might have been accuſed of betraying my Cauſe, if, whilſt I endeavoured to act the Part of a Mediator, and to give to every Side its juſt due, I had omitted what theſe two elegant Advocates had ſeverally alledged for their reſpective Hypotheſes.

What Cenſure the World will paſs upon my Performance, I know not; only I am willing to think that thoſe who ſhall not agree to what I ſay, will grant that I have repreſented the Opinions of other Men with Impartiality and Candour, and that I have not diſcovered any Bigottry or Inclination to any one particular Side; which will be a good Step to make them believe, that I ſhall not obſtinately defend any one Poſition, which may hereafter be proved to be erroneous.

June 11. 1694.

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☞ THE Reader is deſired to take Notice, that the Second Edition of Sir *William Temple's Eſſay* is quoted every where in this Book; but that all the Citations are alſo to be found in the Third Edition, which was Corrected and Enlarged by the Author.

ERRATA.

PAg. 90. lin. 5. r. *Accounts.* p. 94, 95. r. *Van Dalen.* p. 122. l. 5. r. *exurere.* p. 145. l. ult. for *Mechanicks*, r. *Mathematicks.* p. 146. l. 3. r. *Verbieſt.* p. 164. l. 26. r. *Van Heuraet.* p. 176. l. 24. r. *Limb.* p. 280. l. 22. r. *Ellipſe.* p. 271. l. 3. r. *could.* p. 312. l. 2. r. *when we.* p. 314. l. 26. for *Letter*, r. *Diſcourſe.* p. 315. l. 13. for *it is*, r. *they are.*

REFLE-

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REFLECTIONS UPON Ancient and Modern LEARNING.

CHAP. I.

General Reflections upon the State of the Question.

THE present State of the Designs and Studies of Mankind is so very different from what it was 150 Years ago, that it is no Wonder if Men's Notions concerning them vary as much as the Things themselves. This great Difference arises from the Desire which every Man has, who believes that he can do greater Things than his Neighbours, of letting them see how much he does excel them: This will oblige him to omit no Opportunity that offers it self to do it, and afterwards to

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expreſs his Satisfaction that he has done it. This is not only viſible in particular Perſons, but in the ſeveral Ages of Mankind, which are only Communities of particular Perſons, living at the ſame time, as often as their Humours, or their Intereſts, lead them to purſue the ſame Methods. This Emulation equally ſhews it ſelf, whatſoever the Subject be, about which it is employed; whether it be about Matters of Trade, or War, or Learning, it is all one: One Nation will ſtrive to out-do another, and ſo will one Age too, when ſeveral Nations agree in the purſuit of the ſame Deſign; only the Jealouſie is not ſo great in the Conteſt for Learning, as it is in that for Riches and Power; becauſe theſe are Things which every ſeveral People ſtrive to ingroſs all to themſelves, ſo that it is impoſſible for bordering Nations to ſuffer with any Patience that their Neighbours ſhould grow as great as they in either of them, to their own prejudice; though they will all agree in raiſing the Credit of the Age they live in upon that Account, that being the only Thing wherein their Intereſts do perfectly unite.

If this Way of Reaſoning will hold, it may be asked how it comes to paſs, that the Learned Men of the laſt Age did not pretend

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pretend that they out-did the Ancients, as well as ſome do now? They would, without queſtion, could they have had any Colour for it: It was the Work of one Age to remove the Rubbiſh, and to clear the Way for future Inventors. Men ſeldom ſtrive for Maſtery, where the Superiority is not in ſome ſort diſputable; then it is that they begin to ſtrive; accordingly, as ſoon as there was a fair Pretence for ſuch a Diſpute, there were not wanting thoſe who ſoon made the moſt of it, both by exalting their own Performances, and diſparaging every Thing that had been done of that kind by their Predeceſſors: 'Till the new Philoſophy had gotten Ground in the World, this was done very ſparingly; which is but within the Compaſs of 40 or 50 Years. There were but few before, who would be thought to have exceeded the Ancients, unleſs it were ſome few Phyſicians, who ſet up Chymical Methods of Practice, and Theories of Diſeaſes, founded upon Chymical Notions, in oppoſition to the *Galenical*: But theſe Men, for want of converſing much out of their own Laboratories, were unable to maintain their Cauſe to the general Conviction of Mankind: The Credit of the Cures which they wrought, not ſupporting them e-

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nough againſt the Reaſonings of their Adverſaries.

Soon after the Reſtauration of King *Charles* II. upon the Inſtitution of the *Royal Society*, the Comparative Excellency of the Old and New Philoſophy was eagerly debated in *England*. But the Diſputes then managed between *Stubbe* and *Glanvile*, were rather Perſonal, relating to the Royal Society, than General, relating to Knowledge in its utmoſt extent. In *France* this Controverſie has been taken up more at large: The *French* were not ſatisfied to argue the Point in Philoſophy and Mathematicks, but even in Poetry and Oratory too; where the Ancients had the general Prejudice of the Learned on their Side. Monſieur *de Fontenelle*, the celebrated Author of a Book *concerning the Plurality of Worlds*, begun the Diſpute about ſix Years ago, in a little Diſcourſe annexed to his *Paſtorals*. He is ſomething ſhy in declaring his Mind; at leaſt, in arraigning the Ancients, whoſe Reputations were already eſtabliſhed; though it is plain he would be underſtood to give the Moderns the Preference in Poetry and Oratory, as well as in Philoſophy and Mathematicks. His Book being received with great Applauſe, it was oppoſed in *England* by Sir *William Temple*, who, in the

Second

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Second Part of his *Miſcellanea*, has printed an Eſſay upon this very Subject. Had Monſieur *de Fontenelle*'s Diſcourſe paſſed unqueſtioned, it would have been very ſtrange, ſince there never was a new Notion ſtarted in the World, but ſome were found, who did as eagerly contradict it.

The Opinion which Sir *William Temple* appears for, is received by ſo great a Number of Learned Men, that thoſe who oppoſe it ought to bring much more than a poſitive Affirmation; otherwiſe, they cannot expect that the World ſhould give Judgment in their Favour. The Queſtion now to be asked, has formerly been enquired into by few, beſides thoſe who have chiefly valued Oratory, Poeſie, and all that which the *French* call the *Belles Lettres*; that is to ſay, all thoſe Arts of Eloquence, wherein the Ancients are generally agreed to have been very excellent. So that Monſieur *de Fontenelle* took the wrong Courſe to have his Paradox be believed; for he aſſerts all, and proves little; he makes no Induction of Particulars, and rarely enters into the Merits of the Cauſe: He declares that he thinks Love of Eaſe to be the reigning Principle amongſt Mankind; for which Reaſon perhaps he was loath to put himſelf to

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the trouble of being too minute. It was no wonder therefore if those to whom his Proposition appeared entirely new, condemned him of *Sufficiency, the worst Composition out of the Pride and Ignorance of Mankind.*

However, since his Reasonings are, generally speaking, very just, especially where he discourses of the Comparative Force of the Genius's of Men in the several Ages of the World, I resolved to make some Enquiry into the Particulars of those Things which are asserted by some to be Modern Discoveries, and vindicated to the Ancients by others.

The General Proposition which Sir *William Temple* endeavours to prove in this Essay, is this, "That if we reflect "upon the Advantages which the ancient *Greeks* and *Romans* had, to improve themselves in Arts and Sciences, "above what the Moderns can pretend "to; and upon that natural Force of Genius, so discernable in the earliest Writers, whose Books are still extant, which "has not been equalled in any Persons "that have set up for Promoters of Knowledge in these latter Ages, and compare the Actual Performances of them "both together, we ought in Justice to "conclude, that the Learning of the pre-

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" ſent Age, is only a faint, imperfect " Copy from the Knowledge of former " Times, ſuch as could be taken from " thoſe ſcattered Fragments which were " ſaved out of the general Shipwreck.

The Queſtion that ariſes from this Propoſition will be fully underſtood, if we enquire, (1.) Into thoſe Things which the Ancients may have been ſuppoſed to bring to Perfection, (in caſe they did ſo) not becauſe they excelled thoſe that came after them in Underſtanding, but becauſe they got the Start by being born firſt. (2.) Whether there are any Arts or Sciences which were more perfectly practiſed by the Ancients, though all imaginable Care hath been ſince uſed to equal them. (3.) Whether there may not be others wherein they are exceeded by the Moderns, though we may reaſonably ſuppoſe that both Sides did as well as they could.

When ſuch Enquiries have once been made, it will be no hard matter to draw ſuch Inferences afterwards, as will enable us to do Juſtice to both Sides.

It muſt be owned, that theſe Enquiries do not immediately reſolve the Queſtion which Sir *William Temple* put, for he confounds two very different Things together; namely, *Who were the Greateſt Men, the Ancients, or the Moderns?* and,

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Who have carried their Enquiries furtheſt? The firſt is a very proper Queſtion for a Declamation, though not ſo proper for a Diſcourſe, wherein Men are ſuppoſed to reaſon ſeverely, becauſe, for want of Mediums whereon to found an Argument, it cannot eaſily be decided: For, though there be no ſurer Way of judging of the Comparative Force of the Genius's of ſeveral Men, than by examining the reſpective Beauty or Subtilty of their Performances; yet the good Fortune of appearing firſt, added to the Misfortune of wanting a Guide, gives the firſt Comers ſo great an Advantage, that though, for inſtance, the *Fairy Queen*, or *Paradiſe Loſt*, may be thought by ſome to be better Poems than the *Ilias*; yet the ſame Perſons will not ſay but that *Homer* was a greater Genius than either *Spencer* or *Milton*. And beſides, when Men judge of the Greatneſs of an Inventor's Genius barely by the Subtilty and Curioſity of his Inventions, they may be very liable to Miſtakes in their Judgments, unleſs they knew, and were able to judge of the Eaſineſs or Difficulty of thoſe Methods, or Ratiocinations, by which theſe Men arrived at, and perfected theſe their Inventions; which, with due Allowances, is equally applicable to any Performances

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formances in Matters of Learning of any ſort.

It will however be ſome Satisfaction to thoſe who are concerned for the Glory of the Age in which they live, if, in the firſt place, it can be proved, That as there are ſome parts of real and uſeful Knowledge, wherein not only great Strictneſs of Reaſoning, but Force and Extent of Thought is required thoroughly to comprehend what is already invented, much more to make any conſiderable Improvements, ſo that there can be no Diſpute of the Strength of ſuch Men's Underſtandings, who are able to make ſuch Improvements; ſo in thoſe very Things, ſuch, and ſo great Diſcoveries have been made, as will oblige impartial Judges to acknowledge, that there is no probability that the World decays in Vigour, and Strength, if (according to Sir *William Temple*'s Hypotheſis) we take our Eſtimate from the Meaſure of thoſe Men's Parts, who have made theſe Advancements in theſe later Years; eſpecially, if it ſhould be found that the Ancients took a great deal of pains upon theſe very Subjects, and had able Maſters to inſtruct them at their firſt ſetting out: And Secondly, If it ſhould be proved, that there are other curious and uſeful Parts of Knowledge, wherein the Ancients

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cients had equal Opportunities of advancing and purſuing their Enquiries, with as much Facility as the Moderns, which were either ſlightly paſſed over, or wholly neglected, if we ſet the Labours of ſome few Men aſide: And Laſtly, If it ſhould be proved, that by ſome great and happy Inventions, wholly unknown to former Ages, new and ſpacious Fields of Knowledge have been diſcovered, and, purſuant to thoſe Diſcoveries, have been viewed, and ſearched into, with all the Care and Exactneſs which ſuch noble Theories required. If theſe Three Things ſhould be done, both Queſtions would be at once reſolved, and Sir *William Temple* would ſee that the Moderns have done ſomething more than Copy from their Teachers, and that there is no abſolute neceſſity of making all thoſe melancholy Reflections upon *(a) the Sufficiency and Ignorance of the preſent Age*, which he, moved with a juſt Reſentment and Indignation, has thought fit to beſtow upon them.

(a) Pag. 5. 55, 56.

How far theſe Things can, or cannot be proved, ſhall be my Buſineſs in theſe following Papers to enquire. But Firſt, Of thoſe Things wherein, if the Ancients have ſo far excelled as to bring them to Perfection, it may be thought that they did it becauſe they were born before us.

CHAP.

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CHAP. II.

Of the Moral and Political Knowledge of the Ancients and Moderns.

I Have often thought that there could not be a pleaſanter Entertainment to an inquiſitive Man, than to run over the firſt Thoughts which he had in his Infancy, whilſt he was gathering his Collection of *Idea's*, and labouring to expreſs thoſe Sounds, by which he perceived that his Mother and Nurſe made themſelves be underſtood. We ſhould then ſee the true Gradations by which Knowledge is acquired: We ſhould judge, perhaps, what is in it ſelf hard, and what eaſie, and alſo what it is that makes them ſo; and thereby make a better Eſtimate of the Force of Men's Underſtandings, than can now be made. But this it is in vain to lament for, ſince it can never be had. Yet it may in general be obſerved, that the firſt Thoughts of Infants are of Things immediately neceſſary for Life. That being in ſome meaſure ſatisfied, they ſpend their Childhood in Pleaſure, if left to their own Liberty, till they are grown up. Then they begin to reflect upon the Things that

that relate to Prudence and Diſcretion, and that more or leſs, according as their Circumſtances oblige them to carry themſelves more or leſs warily towards thoſe with whom they converſe. This is, and ever was, general to all Mankind; whereas they would not take ſo much pains to cultivate the Arts of Luxury and Magnificence, if they were not ſpurred on by Pride, and a Deſire of not being behind other Men. So that it is reaſonable to ſuppoſe, that, all thoſe Things which relate to Moral Knowledge, taken in its largeſt Extent, were underſtood by the ancient *Egyptians*, *Greeks* and *Romans*, in as great Perfection as the Things themſelves were capable of. The Arts of Governing of Kingdoms and Families; of Managing the Affections and Fears of the unconſtant Multitude; of Ruling their Paſſions, and Diſcourſing concerning their ſeveral Ways of Working; of Making prudent Laws, and Laying down wiſe Methods by which they might be the more eaſily and effectually obeyed; of Converſing each with other; of Giving and Paying all that Reſpect which is due to Men's ſeveral Qualities: In ſhort, all that is commonly meant by knowing the World, and underſtanding Mankind; all Things neceſſary to make Men wiſe

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in Counſel, dexterous in Buſineſs, and agreeable in Converſation, ſeem to have been in former Ages thoroughly underſtood, and ſucceſsfully practiſed.

There ſeems, indeed, to be ſome Reaſon to fear, that in the Arts of Knavery and Deceit, the preſent Age may have refined upon the foregoing; but that is ſo little for its Honour, that common Decency does almoſt as much oblige me to throw a Veil over this Reproach, as common Intereſt does all Mankind to put an effectual Stop to its Increaſe. But ſince we are enquiring into Excellencies, not Blemiſhes and Imperfections, there ſeems to be great Reaſon to affirm, that After-Ages had no need to invent Rules, which already were laid down to their Hands; but that their Buſineſs was chiefly to re-examine them, and to ſee which were proper for their Circumſtances, conſidering what Alterations Time ſenſibly introduces into the Cuſtoms of every Age; and then to make a wiſe Choice of what they borrowed, that ſo their Judgment might not be queſtioned by thoſe who ſhould have the Curioſity to compare the Wiſdom of ſeveral Ages together.

If we deſcend into Particulars, theſe Obſervations will, I believe, be found to be very true: The minuteſt Differences between Vertue

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Vertue and Vice of all ſorts, are judiciouſly ſtated by *Ariſtotle*, in his *Ethicks to Nicomachus*. *Xenophon*'s *Cyrus* ſhews that he had a right Notion of all thoſe Things which will make a Prince truly great and wiſe. The Characters of all thoſe Vices which are immediately taken notice of in Civil Life, are admirably drawn by *Theophraſtus*. Nothing can give a clearer *Idea* of one that has lived under Tyrants, than the Writings of *Tacitus*; in whoſe Hiſtories, almoſt every Thing is told in ſuch a Way, as we ſee that Ill Uſage and Diſappointments lead Men to cenſure and report the Actions of former Governors. Great Skill in all the Arts and Secrets of Perſuaſion appear every where in *Demoſthenes* and *Tully*'s Orations, in *Quinctilian*'s Inſtitutions, and the Orations in *Thucydides*, *Salluſt* and *Livy*. The Duties of Mankind in Civil Life, are excellently ſet forth in *Tully*'s *Offices*. Not one Paſſion of the Soul of Man has been untouched, and that with Life too, by ſome or other of the Ancient Poets. It would require a Volume to ſtate theſe Things in their full Light; and it has been done very often by thoſe who have given Characters and Cenſures of Ancient Authors. So that one may juſtly conclude, that there is no one Part of Moral Knowledge, ſtrictly

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ſtrictly ſo called, which was not known by the Ancients, equally well as by the Moderns.

But it would be a wrong Inference to conclude from thence, that the Ancients were greater Genius's than the Men of the preſent Age. For, by Sir *William Temple*'s Confeſſion *(b)*, the *Chineſes* and *Peruans* were governed by excellent Laws: and *Confucius* and *Mango Capac* may well be reckoned amongſt the Law-givers and Philoſophers of thoſe which are commonly called learned Nations; though neither of them, eſpecially the Latter, can juſtly be ſuſpected of learning what they knew by Communication from other Nations. From whence Sir *William Temple* rightly concludes, that Common Sence is of the Growth of every Country; and that all People who unite into Societies, and form Governments, will in time make prudent Laws of all kinds; ſince it is not Strength of Imagination, nor Subtilty of Reaſoning, but Conſtancy in making Obſervations upon the ſeveral Ways of Working of Humane Nature, that firſt ſtored the World with Moral Truths, and put Mankind upon forming ſuch Rules of Practice as beſt ſuited with theſe Obſervations. There is no Wonder therefore, that in a long Series of Ages,

(b) *Eſſay upon Heroick Vertue*, Sect. 2, 3.

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Ages, which preceded *Socrates* and *Plato*, these Matters were carried to a great Perfection; for as the Necessity of any Thing is greater, so it will be more and more generally studied: And as the Subject of our Enquiries is nearer to us, or easier to be comprehended in it self; so it will be more throughly examined, and what is to be known will be more perfectly understood. Both these concurr here: Necessity of conversing with each other put Men upon making numerous Observations upon the Tempers of Mankind: And their own Nature being the Thing enquired after, all Men could make their Experiments at home; which, in Consort with those made with and by other People, enabled them to make certain Conclusions of Eternal Truth, since Mankind varies little, if any thing, any farther than as Customs alter it, from one Age to another. Since therefore this Necessity always lasts, and that all the Observations requisite to compleat this noble Science, as it takes in the Art of Governing Kingdoms, Families, and Men's private Persons, cannot be made by one or two Generations, there is a plain Reason why some Nations, which wanted Opportunities of diffused Conversation, were more barbarous than the rest; and also,

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why others, who for many Ages met with no Foreign Enemies that could overturn their Conſtitutions, ſhould be capable of improving this part of Knowledge as far as *unaſſiſted Reaſon* was able to carry it.

For, after all, how weak the Knowledge of the ancient Heathens was, even here, will appear by comparing the Writings of the old Philoſophers, with thoſe Moral Rules which *Solomon* left us in the *Old Teſtament*, and which our Bleſſed Saviour and his Apoſtles laid down in the *New*. Rules ſo well ſuited to the Reaſon of Man, ſo well adapted to civilize the World, and to introduce that true Happineſs which the old Philoſophers ſo vainly ſtrove to find, that the more they are conſidered, the more they will be valued: and accordingly, they have extorted even from thoſe who did not believe the Chriſtian Religion, juſt Applauſes, which were certainly unbiaſſed, becauſe, not being led by the Rewards which it propoſes, nor deterred by the Puniſhments which it threatens, they could have no Motive to commend them but their own native Excellency. So that one may juſtly wonder why Sir *W. T.* ſhould give us an Account of *Mahomet*'s Life, and that ſo minutely, as not to omit *the Sergian Monk*,

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his Master (c), in his Essay of Heroick Vertue; where he mentions Law-givers, as well as Generals, and yet take no notice of *Moses* and *Jesus Christ*.

(c) Essay 3. pag. 248. *He means* Sergius, *a Monk; turning the Name of a Man into the Denomination of an Order.* Sergius *is said to have been a* Nestorian.

It is evident therefore, that though in some Sence the Moderns may be said to have learned their Politicks and Ethicks from the Ancients, yet there is no convincing Argument that can be brought from those Sciences, singly considered, that the Ancients had a greater Force of Genius than the wise and prudent Men of these later Generations. If, indeed, in all other Sciences, Mankind has for 1500 Years been at a full Stop, the Perfection of the Ancient Politicks and Ethicks may be justly urged, amongst other Arguments, for the comparative Strength of their Parts; otherwise not.

But there are other Parts of Learning, that may seem capable of farther Improvement; of which, the Advocates for the Ancients do not only pretend that they were the Inventors, but that their Performances have never since been equalled, much less out-done; though within these last 200 Years all imaginable Pains have been taken to do it; and great Rewards have been given to those who have,

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licèt non paſſibus æquis, laboured to come near the Copies which were already ſet them. From whence theſe Men think it probable that all Modern Learning is but Imitation, and that faint and flat, like the Paintings of thoſe who draw after Copies at a Third or Fourth Hand from the Life. Now, as this can only be known by an Induction of Particulars, ſo of theſe Particulars there are two ſorts: One, of thoſe wherein the greateſt part of thoſe Learned Men who have compared Ancient and Modern Performances, either give up the Cauſe to the Ancients quite, or think, at leaſt, that the Moderns have not gone beyond them. The other of thoſe, where the Advocates for the Moderns think the Caſe ſo clear on their Side, that they wonder how any Man can diſpute it with them. Poeſie, Oratory, Architecture, Painting, and Statuary, are of the Firſt Sort: Natural Hiſtory, Phyſiology, and Mathematicks, with all their Dependencies, are of the Second.

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CHAP. III.

Of Ancient and Modern Eloquence and Poeſie.

IT is acknowledged by moſt Men, that he who has ſtudied any Subject, is a better Judge of that Subject than another Man who did never purpoſely bend his Thoughts that way, provided they be both Men of equal Parts. Yet we ſee there are many Things, whereof Men will, at firſt ſight, paſs their Judgment, and obſtinately adhere to it, though they not only know nothing of thoſe Matters, but will confeſs that it requires Parts, and Skill, and Exerciſe, to be excellent in them. This is remarkably viſible in the Cenſures which are paſſed upon Pieces of Oratory and Poeſie every Day by thoſe who have very little, or none, of that ſort of Learning themſelves; and to whom all that is ſaid of Skill in thoſe Things, and of a true Reliſh of what is really fine, is Jargon and Cant. And in the mean time, theſe Men do in other Things ſhew great Accuracy and Judgment, even in Subjects which require quick Apprehenſion, nice Obſervation, and

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and frequent Meditation. If one ſhould ask why ſuch Men ſo frequently miſtake and differ in thoſe other Matters, the Anſwer, I think is this: (1.) The Foundations of Eloquence of all ſorts lying in Common Sence, of which every Man is in ſome degree a Maſter, moſt ingenious Men have, without any Study, a little Inſight into theſe Things. This little Inſight betrays them immediately to declare their Opinions, becauſe they are afraid, if they ſhould not, their Reputation would be in danger. On the contrary, where the Subject is ſuch, that every Man finds he can frame no *Idea* of it in his own Mind, without a great number of Premiſes, which cannot be attained by common Converſation, all wiſe Men hold their Hands, ſuſpect their own Abilities, and are afraid that they cannot fathom the Depth of his Knowledge with whom they converſe; eſpecially if he has a Name for Skill in thoſe Matters. And therefore, talk with ſuch Men of a Law-Caſe, or a Problem in Geometry, if they never ſtudied thoſe Things, they will frankly tell you ſo, and decline to give their Opinion. Whereas if you ſpeak to them of a Poem, a Play, or a Moral Diſcourſe upon a Subject capable of Rhetorical Ornaments, they will immediately

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pass their Censure, right or wrong; and Twenty Men, perhaps, shall give Twenty different Opinions; whilst, in the other Cases, scarce Two of the Twenty shall disagree, if they are conscious to themselves that they have Skill enough to judge without another's help. (2.) In most of these Things our Passions are some Way or other concerned; at least, being accustomed to have them moved, we expect it, and think our selves disappointed when our Expectation is deceived. Now, when a Man is to judge in Matters of this kind, he generally beforehand is pre-possessed with such Passions as he would willingly have raised, or confirmed; and so speaks as his Expectation is answered. But when our Passions do not move in these Matters, as they seldom do upon Subjects a great way off, then our Censures are more unanimous. For, as the Poet says,

Securus licet Æneam Rutulumq; ferocem
Committas; nulli gravis est percussus Achilles.

So that there is no great Wonder why Men should receive the Writings of the Ancients with so great Respect: For the Distance of Time takes off Envy; and the being

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being accuſtomed from our Childhood to hear them commended, creates a Reverence. Yet though due Allowances ought to be made for theſe Pre-poſſeſſions, one has Reaſon to believe, that this Reverence for the Ancient Orators and Poets is more than Prejudice. (By Orators, I underſtand all thoſe Writers in Proſe who took pains to beautifie and adorn their Stile.) Their Works give us a very ſolid Pleaſure when we read them. The beſt in their kind among the Moderns have been thoſe who have read the Ancients with greateſt Care, and endeavoured to imitate them with the greateſt Accuracy. The Maſters of Writing in all theſe ſeveral Ways, to this Day, appeal to the Ancients, as their Guides; and ſtill fetch Rules from them, for the Art of Writing. *Homer*, and *Ariſtotle*, and *Virgil*, and *Horace*, and *Ovid*, and *Terence*, are now ſtudied as Teachers, not barely out of Curioſity, by Modern Poets. So likewiſe are *Demoſthenes*, *Ariſtotle*, *Tully*, *Quinctilian*, and *Longinus*, by thoſe who would write finely in Proſe. So that there is Reaſon to think that in theſe Arts the Ancients may have out-done the Moderns; though neither have they been neglected in theſe later Ages, in which we have ſeen extraordinary Productions,

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which the Ancients themſelves, had they been alive, would not have been aſhamed of.

If this be ſo, as I verily believe it is, ſure now (it will be objected) It is evident that the Ancients had a greater Force of Genius than the Moderns can pretend to. Will it be urged, that here alſo they had an Advantage by being born firſt? Have theſe Arts a fixed Foundation in Nature; or were they not attained to by Study? If by Nature, why have we heard of no Orators among the Inhabitants of the Bay of *Soldania*, or eminent Poets in *Peru*? If by Study, why not now, as well as formerly, ſince Printing has made Learning cheap and eaſie? Does it ſeem harder to ſpeak and write like *Cicero* or *Virgil*, than to find out the motions of the Heavens, and to calculate the Diſtances of the Stars? What can be the Reaſon of this Diſparity?

The Reaſons are ſeveral, and ſcarce one of them of ſuch a Nature as can now be helped, and yet not concluſive againſt the Comparative Strength of Underſtanding, evidently diſcernible in the Productions of the Learned Men of the preſent, and immediately foregoing Ages; to which I would be underſtood ſtrictly to confine my Notion of the Word *Modern*.

Theſe

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Theſe Reaſons I ſhall examine at large, becauſe, if they are valid, they quite take away the Force of Sir *William Temple*'s Hypotheſis; and by removing the blind Admiration now paid to the Ancient Orators and Poets, ſet it upon ſuch a Foot as will render the Reading of their Books more uſeful, becauſe leſs ſuperſtitious. They are of ſeveral Sorts; ſome relating to Oratory, ſome to Poeſie, and ſome in common to both.

I ſhall firſt ſpeak of thoſe which relate more particularly to Poetry, becauſe it was much the ancienteſt Way of Writing in *Greece*; where their Orators owned, that they learned a great deal of what they knew, even in their own, as well as in other Parts of Learning, from their Poets. And here one may obſerve, that no Poetry can be Charming that has not a Language to ſupport it. The *Greek* Tongue has a vaſt Variety of long Words, wherein long and ſhort Syllables are agreeably intermixed together, with great Numbers of Vowels and Diphthongs in the Middle-Syllables, and thoſe very ſeldom clogged by the joyning of harſh-ſounding Conſonants in the ſame Syllable: All which Things give it a vaſt Advantage above any other Language that has ever yet been cultivated by Learned

Men,

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Men. By this Means all manner of Tunable Numbers may be formed in it with Eaſe; as ſtill appears in the remaining *Dramatick* and *Lyrick* Compoſures of the *Greek* Poets. This ſeems to have been at firſt a lucky Accident, ſince it is as viſible in *Homer*, who lived before the Grammarians had determined the Analogy of that Language by Rules; which Rules were, in a very great meaſure, taken from his Poems, as the Standard; as in thoſe Poets that came after him. And that this peculiar Smoothneſs of the *Greek* Language was at firſt Accidental, farther appears, becauſe the *Phœnician* or *Hebrew* Tongue, from whence it was formed, as moſt Learned Men agree, is a rough, unpoliſhed Tongue; abounding with ſhort Words, and harſh Conſonants: So that if one allows for ſome very ſmall Agreement in the Numbers of Nouns, and Variations of Tenſes in Verbs, the two Languages are wholly of a different Make. That a derived Language ſhould be ſweeter than its Mother-Tongue, will ſeem ſtrange to none that compares the Modern *Tuſcan* with the Ancient *Latin*; where, though their Affinity is viſible at firſt Sight, in every Sentence, yet one ſees that that derived Language actually has a Sweetneſs and Tunableneſs in its Com-

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Compoſition, that could not be derived from its Parent; ſince nothing can impart that to another, which it has not it ſelf: And it ſhows likewiſe, that a Barbarous People, as the *Italians* were when mingled with the *Goths* and *Lombards*, may, without knowing or minding Grammatical Analogy, form a Language ſo very muſical, that no Art can mend it. For, in *Boccace*'s Time, who lived above 300 Years ago, in the earlieſt Dawnings of Polite Learning in theſe Weſtern Parts of the World, *Italian* was a formed Language, endued with that peculiar Smoothneſs which other *European* Languages wanted; and it has ſince ſuffered no fundamental Alterations; not any, at leaſt, for the better, ſince in the *Dictionary* of the Academy *della Cruſca*, *Boccace*'s Writings are often appealed to in doubtful Caſes, which concern the Niceties of the Tongue.

Now, when this Native Smoothneſs of the *Greek* Tongue was once diſcovered to common Ears, by the ſweetneſs of their Verſes, which depended upon a Regular Compoſition of Long and Short Syllables, all Men paid great Reſpect to their Poets, who gave them ſo delightful an Entertainment. The wiſer Sort took this Opportunity of Civilizing the reſt, by putting

putting all their Theological and Philoſophical Inſtructions into Verſe; which being learnt with Pleaſure, and remembred with Eaſe, helped to heighten and preſerve the Veneration already, upon other Scores, paid to their Poets. This increaſed the Number of Rivals, and every one ſtriving to out-do his Neighbour; ſome by varying their Numbers, others by chuſing Subjects likely to pleaſe, here and there ſome, one or two at leaſt of a ſort, proved excellent: And then, thoſe who were the moſt extraordinary in their ſeveral Ways, were eſteemed as Standards by ſucceeding Ages; and Rules were framed by their Works, to examine other Poems of the ſame ſort. Thus *Ariſtotle* framed Rules of *Epick* Poeſie from *Homer*: Thus *Ariſtophanes*, *Menander*, *Sophocles* and *Euripides* were looked upon as Maſters in *Dramatick* Poeſie; and their Practice was ſufficient Authority. Thus *Mimnermus*, *Philetas* and *Callimachus* were the Patterns to following Imitators for *Elegy* and *Epigram*. Now, Poetry being a limited Art, and theſe Men, after the often-repeated Trials of others, had proved ſucceſsleſs; finding the true Secret of pleaſing their Country-men, partly by their Wit and Sence, and partly by the inimitable Sweetneſs of their Numbers,

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there is no Wonder that their Succeſſors, who were to write to a pre-poſſeſſed Audience, though otherwiſe Men of equal, perhaps greater Parts, failed of that Applauſe of which the great Maſters were already in poſſeſſion; for Copying nauſeates more in Poetry, than any thing: So that *Buchanan* and *Sannazarius*, tho' admirable Poets, are not read with that Pleaſure which Men find in *Lucretius* and *Virgil*, by any but their Country-men, becauſe they wrote in a dead Language, and ſo were frequently obliged to uſe the ſame Turns of Thought, and always the ſame Words and Phraſes, in the ſame Senſe in which they were uſed before by the Original Authors; which forces their Readers too often to look back upon their Maſters; and ſo abates of that Pleaſure which Men take in *Milton*, *Cowley*, *Butler*, or *Dryden*, who wrote in their Mother-Tongue, and ſo were able to give that unconſtrained Range and Turn to their Thoughts and Expreſſions that are truly neceſſary to make a compleat Poem.

It may therefore be very reaſonably believed, that the natural Softneſs, Expreſſiveneſs and Fulneſs of the *Greek* Language gave great Encouragement to the *Greek* Poets to labour hard, when they had

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had such manageable Matter to work upon, and when such Rewards constantly attended their Labours. This likewise was a great Help to their Orators, as well as their Poets; who soon found the Beauties of a numerous Composition, and left nothing undone, that could bring it to its utmost Perfection. But this was not so important a Consideration, as alone to have encouraged the *Greeks* to cultivate their Eloquence, if the Constitution of their Governments had not made it necessary; and that Necessity had not obliged a very great Number of ingenious Men to take Pains about it.

Most part of *Greece*, properly so called, and of *Asia the Less*, the Coasts of *Thrace*, *Sicily*, the Islands in the *Mediterranean*, and a great part of *Italy*, were long divided into great Numbers of Kingdoms and Commonwealths; and many of these small Kingdoms, taking Example by their neighbouring Cities that had thrown off their imperious Masters, turned, in time, to Commonwealths, as well as they. These, as all little Governments that are contiguous, being well nigh an even Match for each other, continued for many Ages in that Condition. Many of the chiefest were Democracies; as, the Republicks of *Athens*, *Syracuse*, *Thebes* and *Corinth*; where

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where it was neceſſary to complement the People upon all Occaſions: So that buſie, factious Men had Opportunities enough to ſhew their Skill in Politicks. Men of all Tempers, and all Deſigns, that would accuſe or defend, that would adviſe or conſult, were obliged to addreſs themſelves in ſet Harangues to the People. Intereſt therefore, and Vanity, Motives ſometimes equally powerful, made the Study of Rhetorick neceſſary; and whilſt every Man followed the ſeveral Bias of his own Genius, ſome few found out the true Secret of Pleaſing, in all the ſeveral Ways of Speaking well, which are ſo admirably, and ſo largely diſcourſed of by the ancient Rhetoricians. *Demoſthenes* being eſteemed beyond all his Predeceſſors, for the Correctneſs of his Stile, the Juſtneſs of his Figures, the Eaſineſs of his Narrations, and the Force of his Thoughts; his Orations were looked upon as Standards of Eloquence by his Country-men: Which Notion of theirs effectually damped future Endeavours of other Men, ſince here, as well as in Poetry and Painting, all Copiers will ever continue on this ſide of their Originals. And beſides, the great End of Oratory being to perſuade, wherein Regard muſt be had to the Audience, as well as to the Subject, if there be but one

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one Way of doing beſt at the ſame time in both, as there can be but one in all limited Arts or Sciences, they that either firſt find it out, or come the neareſt to it, will unqueſtionably, and of Right, keep the firſt Station in Men's Eſteem, though perhaps they dare not, for fear of diſguſting the Age they live in, follow thoſe Methods which they admire ſo much, and ſo juſtly, in thoſe great Maſters that went before them.

That theſe Accidents, and not a particular Force of Genius, raiſed the *Grecian* Poeſie and Oratory, will further appear, if we reflect upon the Hiſtory of the Riſe and Increaſe of both thoſe Arts amongſt the *Romans:* Their Learning, as well as their Language, came originally from *Greece;* they ſaw what was done to their Hands, and *Greek* was a living Language; and ſo, by the help of Maſters, they could judge of all its Beauties. Yet, with all their Care, and Skill, and Pains, they could not, of a long time, bring their Poetry to any Smoothneſs; they found that their Language was not ſo ductile, they owned it, and complained of it. It had a Majeſtick Gravity, derived from the People themſelves who ſpoke it; which made it proper for Philoſophical and Epical Poems; for which Reaſon,

Lucretius

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Lucretius and *Virgil* were able to do ſo great Things in their ſeveral Ways, their Language enabling them to give the moſt becoming Beauties to all their Thoughts. But there not being that Variety of Feet in the *Latin*, which Language, for the moſt part, abounds in *Dactyles*, *Spondees* and *Trochees*; nor that Sprightlineſs of Temper, and in-bred Gaiety in the *Romans*, which the *Greeks* are to this Day famous for, even to a Proverb, in many Parts of Poetry they yielded, though not without Reluctancy, to a People whom they themſelves had conquered. Which ſhews, that Natural Imperfections cannot be overcome: And when theſe Imperfections are accidental, as the Language is which every Man ſpeaks at firſt, though he has equal Parts, and perhaps greater Induſtry, yet he ſhall be thrown behind another Man who does not labour under thoſe Inconveniences; and the Diſtance between them will be greater, or leſs, according to the Greatneſs or Quality of theſe Inconveniences.

If we bring this Thing down to Modern Languages, we ſhall find them labouring under much greater: For, the Quantities of Syllables being, in a manner, loſt in all Modern Languages, we can have no Notion of that Variety of

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Feet which was anciently uſed by the *Greeks* and *Romans*, in Modern Poems. The Guide of Verſes is not now Length of Syllable, but only Number of Feet, and Accent: Moſt of the *French* Accents are in the laſt Syllable; Ours, and the *Italian*, in the fore-going. This fits *French* for ſome ſorts of Poems, which *Italian* and *Engliſh* are not ſo proper for. Again, All Syllables, except the Accented one in each Word, being now common in Modern Languages, we Northern People often make a Syllable ſhort, that has two or three Conſonants in it, becauſe we abound in Conſonants: This makes *Engliſh* more unfit for ſome Poems, than *French* and *Italian*; which having fewer Conſonants, have conſequently a greater Smoothneſs and Flowingneſs of Feet, and Rapidity of Pronunciation.

I have brought theſe Inſtances out of Modern Languages, whereof Sir *William Temple* is ſo great a Maſter, to prove my firſt Aſſertion; namely, That though a very great deal is to be given to the Genius and Judgment of the Poet, which are both abſolutely neceſſary to make a good Poem, what Tongue ſoever the Poet writes in; yet the Language it ſelf has ſo great an Influence, that if *Homer* and *Virgil* had been *Polanders*, or *High-Dutch-*

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Dutch-Men, they would never, in all probability, have thought it worth their while to attempt the Writing of Heroick Poems; *Virgil* eſpecially, (c) who began to write an Hiſtorical Poem of ſome great Actions of his Country-men; but was ſo gravelled with the Roughneſs of the *Roman* Names, that he laid it aſide.

(c) *Cum res Romanas inchoaſſet, offenſus materiâ & nominum aſperitate, ad Bucolica tranſiit.* Donatus in Vitâ Virgilii.

Now, as the *Roman* Poetry arrived to that Perfection which it had, becauſe it was ſupported by a Language which, though in ſome Things inferiour to the *Greek*, had noble and charming Beauties, not now to be found in Modern Languages; ſo the *Roman* Oratory was owing to their Government: Which makes the Parallel much more perfect: And all thoſe Reaſons alledged already for the Growth of the *Attick* Eloquence, are equally applicable to the Hiſtory of the *Roman*; ſo that there is no Neceſſity of Repeating them. To which we may add, That when the *Romans* once loſt their Liberty, their Eloquence ſoon fell: And *Tacitus* (or *Quinctilian*) needed not have gone ſo far about to ſearch for Reaſons of the Decay of the *Roman* Eloquence. *Tully* left his Country and Profeſſion, after his Defence of *S. Roſcius Amerinus*; reſolv-

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ing to give over Pleading, if *Sylla*'s Death had not reſtored that Freedom which only gave Life to his Oratory: And when the Civil Wars between *Pompey* and *Caſar* came on, he retired, becauſe his Profeſſion was ſuperſeded by a rougher Rhetorick, which commands an Attentive Audience in all Countries where it pleads.

When Orators are no longer Conſtituent Parts of a Government, or, at leaſt, when Eloquence is not an almoſt certain Step to arrive at the chiefeſt Honours in a State, the Neceſſity of the Art of Speaking is, in a great meaſure, taken off; and as the Authority of Orators leſſens, which it will inſenſibly do as Tyranny and Abſolute Power prevail, their Art will dwindle into Declamation, and an Affectation of Sentences, and Forms of Wit. The Old Men, who out-live their former Splendor, will, perhaps, ſet their own Scholars and Auditors right, and give them a true Reliſh of what is Great and Noble; but that will hardly continue above one or two Generations. Which may be ſuper-added as another Reaſon why there were no more *Demoſthenes's* or *Tullies*, after the *Macedonian* and *Roman* Emperors had taken away the Liberty of their reſpective Commonwealths. It is

Liberty

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Liberty alone which inſpires Men with Lofty Thoughts, and elevates their Souls to a higher Pitch than Rules of Art can direct. Books of Rhetorick make Men Copious and Methodical; but they alone can never infuſe that true Enthuſiaſtick Rage which Liberty breaths into their Souls who enjoy it: And which, guided by a Sedate Judgment, will carry Men further than the greateſt Induſtry, and the quickeſt Parts can go without it.

When private Members of a Commonwealth can have Foreign Princes for their Clients, and plead their Cauſes before their Fellow-Citizens; when Men have their Underſtandings enlarged, by a long Uſe of publick Buſineſs, for many Years before they ſpeak in publick; and when they know that their Auditory are Men, not only of equal Parts, and Experience in Buſineſs; but alſo many of them Men of equal, if not greater Skill in Rhetorick than themſelves: Which was the Caſe of the old *Romans*. Theſe Men, inflamed with the mighty Honour of being Patrons to Crowned Heads, having Liberty to ſpeak any Thing that may advantage their Cauſe, and being obliged to take ſo great Pains to get up to, or to keep above ſo many Rivals, muſt needs be much more excellent Orators, than other Ages,

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deſtitute of ſuch concurrent Circumſtances, though every thing elſe be equal, can poſſibly produce.

Beſides all this, the Humour of the Age which we live in is exceedingly altered: Men apprehend or ſuſpect a Trick in every Thing that is ſaid to move the Paſſions of the Auditory in Courts of Judicature, or in the *Parliament-Houſe*: They think themſelves affronted when ſuch Methods are uſed in Speaking, as if the Orator could ſuppoſe within himſelf, that they were to be catched by ſuch Baits. And therefore, when Men have ſpoken to the Point, in as few Words as the Matter will bear, it is expected they ſhould hold their Tongues. Even in the Pulpit, the Pomp of Rhetorick is not always commended; and very few meet with Applauſe, who do not confine themſelves to ſpeak with the Severity of a Philoſopher, as well as with the Splendour of an Orator; two Things, not always conſiſtent. What a Difference in the Way of Thinking muſt this needs create in the World? Anciently, Orators made their Employment the Work of their whole Lives; and as ſuch, they followed it: All their Studies, even in other Things, were, by a ſort of Alchemy, turned into Eloquence. The Labour which they thought

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thought requiſite, is evident to any Man that reads *Quinctilian*'s *Inſtitutions*, and the Rhetorical Tracts of *Cicero*. This exceedingly takes off the Wonder: Eloquence may lie in common for Ancients and Moderns, yet thoſe only ſhall be moſt excellent that cultivate it moſt, who live in an Age that is accuſtomed to, and will bear nothing but Maſculine, unaffected Sence; which likewiſe muſt be cloathed with the moſt ſplendid Ornaments of Rhetorick.

Sir *William Temple* will certainly agree with me in this Concluſion, that former Ages made greater Orators, and nobler Poets, than theſe later Ages have done; though perhaps he may diſagree with me about the Way by which I came to my Concluſion; ſince hence it will follow, that the preſent Age, with the ſame Advantages, under the ſame Circumſtances, might produce a *Demoſthenes*, a *Cicero*, a *Horace*, or a *Virgil*; which, for any thing hitherto ſaid to the contrary, ſeems to be very probable.

But, though the Art of Speaking, aſſiſted by all theſe Advantages, ſeems to have been at a greater heighth amongſt the *Greeks* and *Romans*, than it is at preſent, yet it will not follow from thence, that every Thing which is capable of

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Rhetorical Ornaments ſhould, for that ſole Reaſon, be more perfect anciently than now; eſpecially if theſe be only Secondary Beauties, without which, that Diſcourſe wherein they are found may be juſtly valuable, and that in a very high Degree. So that, though, for the purpoſe, one ſhould allow the Ancient Hiſtorians to be better Orators than the Modern, yet theſe laſt may, for all that, be much better, at leaſt, equally good Hiſtorians; thoſe among them eſpecially, who have taken fitting Care to pleaſe the Ears, as well as inſtruct the Underſtandings of their Readers. Of all the *Ancient* Hiſtorians before *Polybius*, none ſeems to have had a right Notion of writing Hiſtory, except *Thucydides*: And therefore *Polybius*, whoſe firſt Aim was, to inſtruct his Reader by leading him into every Place, whither the Thread of his Narrative carried him, makes frequent Excuſes for thoſe Digreſſions, which were but juſt neceſſary to beget a thorough Underſtanding of the Matter of Fact of which he was then giving an Account. Theſe Excuſes ſhow that he took a new Method; and they anſwer an Objection, which might otherwiſe have been raiſed from the ſmall Numbers of extant Hiſtories that were written before his Time;

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Time; as if we could make no Judgment of thoſe that are loſt, from thoſe that are preſerved. For, the Generality of thoſe who wrote before him, made Rhetorick their chief Aim; and therefore all Niceties of Time, and Place, and Perſon, that might hurt the Flowingneſs of their Stile, were omitted; inſtead whereof, the Great Men of their *Drama's* were introduced, making long Speeches; and ſuch a Gloſs was put upon every Thing that was told, as made it appear extraordinary; and Things that were wonderful and prodigious were mentioned with a particular Emphaſis.

This Cenſure will not appear unjuſt to any Man who has read Ancient Hiſtorians with ordinary Care; *Polybius* eſpecially: Who, firſt of all the Ancient Hiſtorians, fixes the Time of every great Action that he mentions: Who aſſigns ſuch Reaſons for all Events, as ſeem, even at this diſtance, neither too great, nor too little: Who, in Military Matters, takes Care, not only to ſhew his own Skill, but to make his Reader a Judge, as well as himſelf: Who, in Civil Affairs, makes his Judgment of the Conduct of every People from the ſeveral Conſtitutions of their reſpective Governments, or from the Characters and Circum-

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cumſtances of the Actors themſelves: And laſt of all, Who ſcrupulouſly avoids ſaying any Thing that might appear incredible to Poſterity; but repreſents Things in ſuch a manner, as a wiſe Man may believe they were tranſacted: And yet he has neglected all that Artful Eloquence which was before ſo much in faſhion.

If theſe therefore be the chiefeſt Perfections of a juſt Hiſtory, and if they can only be the Effects of a great Genius, and great Study, or both; at leaſt, not of the laſt, without the firſt, we are next to enquire whether any of the Moderns have been able to attain to them: And then, if ſeveral may be found, which in none of theſe Excellencies ſeem to yield to the nobleſt of all the Ancient Hiſtories, it will not be difficult to give an Anſwer to Sir *William Temple*'s Queſtion;

(d) Pag. 57 *Whether (d)* D'Avila's *and* Strada's *Hiſtories be beyond thoſe of* Herodotus *and* Livy? I ſhall name but two; *The Memoirs of* Philip Comines, and F. Paul's *Hiſtory of the Council of* Trent.

Philip Comines ought here to be mentioned for many Reaſons: For, beſides that he particularly excels in thoſe very Vertues which are ſo remarkable in *Polybius*, to whom *Lipſius* makes no Scruple

to

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to compare him, he had nothing to help him but Strength of Genius, assisted by Observation and Experience: He owns himself, that he had no Learning; and it is evident to any Man that reads his Writings. He flourished in a barbarous Age, and died just as Learning had crossed the *Alpes*, to get into *France*: So that he could not, by Conversation with Scholars, have those Defects which Learning cures, supplied. This is what cannot be said of the *Thucydides's*, *Polybius's*, *Sallusts*, *Livies*, and *Tacitus's* of Antiquity. Yet, with all these Disadvantages, to which this great one ought also to be added, That by the Monkish Books then in vogue, he might sooner be led out of the Way, than if he had none at all to peruse, his Stile is Masculine and significant; though diffuse, yet not tedious; even his Repetitions, which are not over-frequent, are diverting: His Digressions are wise, proper, and instructing: One sees a profound Knowledge of Mankind in every Observation that he makes; and that without Ill Nature, Pride, or Passion. Not to mention that peculiar Air of Impartiality, which runs through the whole Work; so that it is not easie to withdraw our Assent from every Thing which he says. To all which I need not add,

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add, that his History never tires, though immediately read after *Livy* or *Tacitus*.

In *F. Paul*'s History one may also find the Excellencies before observed in *Polybius*; and it has been nicely examined by dextrous and skilful Adversaries, who have taken the Pains to weigh every Period, and rectifie every Date. So that, besides the Satisfaction which any other admirable History would have afforded us, we have the Pleasure of thinking that we may safely rely upon his Accounts of Things, without being mis-guided in any one leading Particular of great moment, since Adversaries, who had no Inclination to spare him, could not invalidate the Authority of a Book which they had so great a Desire to lessen. I had gone no further than *D'Avila* and *Strada*, if there were as much Reason to believe their Narratives, as there is to commend their Skill in writing. *D'Avila* must be acknowledged to be a most Entertaining Historian; one that wants neither Art, Genius, nor Eloquence, to render his History acceptable. *Strada* imitates the old *Romans* so happily, that those who can relish their Eloquence, will be always pleased with his.

Upon the whole Matter, one may positively say, That where any Thing wherein

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wherein Oratory can only claim a Share, has been equally cultivated by the Moderns, as by the Ancients; they have equalled them at leaſt, if not out-done them, ſetting aſide any particular Graces, which might as well be owing to the Languages in which they wrote, as to the Writers themſelves.

CHAP. IV.

Reflections upon Monſieur Perrault's *Hypotheſis, That Modern Orators and Poets are more excellent than Ancient.*

WHatever becomes of the Reaſons given in the laſt Chapter, for the Excellency of Ancient Eloquence and Poetry, the Poſition it ſelf is ſo generally held, that I do not fear any Oppoſition here at home. It is almoſt an Hereſie in Wit, among our Poets, to ſet up any Modern Name againſt *Homer* or *Virgil*, *Horace* or *Terence*. So that though here and there one ſhould in Diſcourſe prefer the preſent Age, yet ſcarce any Man who ſets a Value upon his own Reputation, will venture

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venture to assert it in Print. Whether this is to be attributed to their Judgment, or Modesty, or both, I will not determine; though I am apt to believe, to both, because in our Neighbour-Nation, which is remarkable for a good deal of what Sir *William Temple* calls *Sufficiency*, some have spoken much more openly.

For the Members of the Academy in *France*, who since the Cardinal *de Richelieu*'s Time, have taken so much Pains to make their Language capable of all those Beauties which they find in Ancient Authors, will not allow me to go so far as I have done. Monsieur *Perrault*, their Advocate, in Oratory sets the Bishop of *Meaux* against *Pericles*, (or rather, *Thucydides*,) the Bishop of *Nismes* against *Isocrates*, *F. Bourdaloüe* against *Lysias*, Monsieur *Voiture* against *Pliny*, and Monsieur *Balzac* against *Cicero*. In Poetry likewise he sets Monsieur *Boileau* against *Horace*, Monsieur *Corneille* and Monsieur *Moliere* against the Ancient *Dramatick* Poets. In short, though he owns that some amongst the Ancients had very exalted Genius's, so that it may, perhaps, be very hard to find any Thing that comes near the Force of some of the Ancient Pieces, in either Kind, amongst our Modern Writers, yet he affirms, that Poetry and Oratory

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tory are now at a greater heighth than ever they were, becauſe there have been many Rules found out ſince *Virgil*'s and *Horace*'s Time; and the old Rules likewiſe have been more carefully ſcanned than ever they were before. This Hypotheſis ought a little to be enquired into; and therefore I ſhall offer ſome few Conſiderations about his Notion. Sir *William Temple*, I am ſure, will not think this a Digreſſion, becauſe the Author *of the* Plurality of Worlds, *(e) by cenſuring of the Old Poetry, and giving Preference to the New, raiſed his Indignation; which no Quality among Men was ſo apt to raiſe in him as Sufficiency, the worſt Compoſition out of the Pride and Ignorance of Mankind.* (e) Pag. 5.

1. Monſieur *Perrault* takes it for granted, that *Cicero* was a better Orator than *Demoſthenes*; becauſe, living after him, the World had gone on for above Two Hundred Years, conſtantly improving, and adding new Obſervations, neceſſary to compleat his Art: And ſo by Conſequence, that the Gentlemen of the Academy muſt out-do *Tully*, for the ſame Reaſons. This Propoſition, which is the Foundation of a great part of his Book, is not very eaſie to be proved; becauſe Mankind loves Variety in thoſe Things wherein it may be had ſo much, that the beſt Things,

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Things, constantly re-iterated, will certainly disgust. Sometimes the Age will not bear Subjects, upon which an Orator may display his full Force; he may often be obliged to little, mean Exercises. A Thousand Accidents, not discoverable at a distance, may force Men to stretch their Inventions to spoil that Eloquence which, left to it self, would do admirable Things. And that there is such a Thing as a Decay of Eloquence in After-Ages, which have the Performances of those that went before constantly to recurr to, and which may be supposed to pretend to Skill and Fineness, is evident from the Writings of *Seneca* and the Younger *Pliny*, compared with *Tully*'s.

2. The Ancients cannot justly be accused of not using an exact and artificial Method in their Orations, if one examines *Tully*'s *Pleadings*, or reads over *Quinctilian*'s *Institutions*. And if Panegyricks and Funeral-Orations do not seem so regular, it is not because Method was little understood, but because in those Discourses it was not so necessary. Where Men were to reason severely, Method was strictly observed: And the Vertues discoursed upon in *Tully*'s *Offices* are as judiciously and clearly digested under their proper Heads, as the Subject-Matter of most

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moſt Diſcourſes written by any Modern Author, upon any Subject whatſoever. And it does not ſeem poſſible to contrive any Poem, whoſe Parts can have a truer, or more artful Connexion, than *Virgil*'s *Æneis*: And though it is now objected by Monſieur *Perrault*, as a Fault, that he did not carry on his Poem to the Marriage of *Æneas* and *Lavinia*, yet we may reaſonably think, that he had very good Reaſons for doing ſo; becauſe, in *Auguſtus*'s Court, where Matters of that ſort were very well underſtood, it was received with as great Veneration as it has been ſince; and never needed the Recommendation of Antiquity, to add to its Authority.

Nay, we can give very probable Reaſons, at this diſtance, for it. It is a Fault in Heroick Poetry, to fetch Things from their firſt Originals: And to carry the Thread of the Narrative down to the laſt Event, is altogether as dull. As *Homer* begins not with the Rape of *Helen*, ſo he does not go ſo far as the Deſtruction of *Troy*. Men ſhould riſe from Table with ſome Appetite remaining: And a Poem ſhould leave ſome View of ſomething to follow, and not quite ſhut the Scenes; eſpecially if the remaining Part of the Story be not capable of much Or-

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nament, nor affords a Variety. The Paſſion of Love, with thoſe that always follow upon its being diſappointed, had been ſhown already in the Story of *Dido*. But Monſieur *Perrault* ſeems to have had his Head poſſeſſed with the *Idea* of *French* Romances; which, to be ſure, muſt never fail to end in a general Wedding.

For I obſerve, *Secondly*, That among other Arguments produced by him, to prove that the Ancients did not perfect their Oratory and Poeſie, he urges this; That the Mind of Man, being an inexhauſtible Fund of new Thoughts and Projects, every Age added Obſervations of its own to the former Store; ſo that they ſtill increaſed in Politeneſs, and by Conſequence, their Eloquence of all ſorts, in Verſe or Proſe, muſt needs be more exact. And as a Proof of this Aſſertion, he inſtances in Matters of Love: wherein the Writings of the beſt bred Gentlemen of all Antiquity, for want of Modern Gallantry, of which they had no Notion, were rude and unpoliſhed, if compared with the Poems and Romances of the preſent Age. Here Monſieur *Perrault*'s Skill in Architecture ſeems to have deceived him: For there is a wide Difference between an Art that, having no Antecedent Foundation in Nature, owes

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owes its first Original to some particular Invention, and all its future Improvements to Superstructures raised by other Men upon that first Ground-work; and between Passions of the Mind, that are Congenial with our Natures; where Conversation will polish them, even without previous Intentions of doing so; and where the Experiences of a few Ages, if assisted by Books that may preserve particular Cases, will carry them to as great an Heighth as the Things themselves are capable of. And therefore, he that now examines the Writings of the Ancient Moral Philosophers, *Aristotle* for instance, or the *Stoicks*, will find, that they made as nice Distinctions in all Matters relating to Vertue and Vice; and that they understood Humane Nature, with all its Passions and Appetites, as accurately as any Philosophers have done since. Besides, It may be justly questioned, whether what Monsieur *Perrault* calls *Politeness*, be not very often rather an Aberration from, and Straining of Nature, than an Improvement of the Manners of the Age: If so, it may reasonably be supposed, that those that medled not with the Niceties of Ceremony and Breeding, before unpractised, rather contemned them as improper or unnatural;

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than omitted them becauſe of the Roughneſs of the Manners of the Ages in which they lived. *Ovid* and *Tibullus* knew what Love was, in its tendereſt Motions; they deſcribe its Anxieties and Diſappointments in a Manner that raiſes too too many Paſſions, even in unconcerned Hearts; they omit no probable Arts of Courtſhip and Addreſs; and keeping the Mark they aim at ſtill in view, they rather chuſe to ſhew their Paſſion, than their Wit: And therefore they are not ſo formal as the Heroes in *Pharamond* or *Caſſandra*; who, by pretending to Exactneſs in all their Methods, commit greater Improbabilities than *Amadis de Gaule* himſelf. In ſhort, *Durfe (e)*, and *Calprenede (f)*, and the reſt of them, by over-ſtraining the String, have broke it: And one can as ſoon believe that *Varillas* and *Maimbourg* wrote the Hiſtories of great Actions juſt as they were done, as that Men ever made Love in ſuch a Way as theſe *Love-and-Honour Men* deſcribe. That Simplicity therefore of the Ancients, which Monſieur *Perrault* undervalues, is ſo far from being a Mark of Rudeneſs, and Want of Complaiſance, that their Fault lay in being too Natural, in making too lively Deſcriptions of Things, where Men want no Foreign Aſſiſtance to help them

(e) *The Author of* Aſtræa.

(f) *The Author of* Cleopatra.

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them to form their *Idea's*; and where Ignorance, could it be had, is more valuable than any, much more than a Critical Knowledge.

3. Since,

By that loud Trumpet which our Courage aids,
We learn, that Sound, as well as Senſe, perſuades;

the Felicity of a manageable Language, when improved by Men of nice Ears, and true Judgments, is greater, and goes further to make Men Orators and Poets, than Monſieur *Perrault* ſeems willing to allow; though there is a plain Reaſon for his Unwillingneſs: The *French* Language wants Strength to temper and ſupport its Smoothneſs for the nobler Parts of Poeſie, and perhaps of Oratory too, though the *French* Nation wants no Accompliſhments neceſſary to make a Poet, or an Orator. Therefore their late Criticks are always ſetting Rules, and telling Men what muſt be done, and what omitted, if they would be Poets. What they find they cannot do themſelves, ſhall be ſo clogged where they may have the Management, that others ſhall be afraid to attempt it. They are too fond of their Language, to acknowledge where the

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Fault lies; and therefore the chief Thing they tell us is, that Sence, Connexion and Method are the principal Things to be minded. Accordingly, they have tranſlated moſt of the Ancient Poets, even the *Lyricks*, into *French* Proſe; and from thoſe Tranſlations they paſs their Judgments, and call upon others to do ſo too. So that when (to uſe Sir *J. Denham*'s Compariſon) by pouring the Spirits of the Ancient Poetry from one Bottle into another, they have loſt the moſt Volatile Parts, and the reſt becomes flat and inſipid; theſe Criticks exclaim againſt the Ancients, as if they did not ſufficiently underſtand Poetical Chymiſtry. This is ſo great a Truth, that even in Oratory it holds, though in a leſs Degree. *Thucydides* therefore has hard Meaſure to be compared with the Biſhop of *Meaux*, when his Oration is turned into another Language, whilſt Monſieur *de Meaux*'s ſtands unaltered; for, though Sence is Sence in every Tongue, yet all Languages have a peculiar Way of expreſſing the ſame Things; which is loſt in Tranſlations, and much more in Monſieur *D' Ablancourt*'s, who profeſſed to mind two very different Things at once; to tranſlate his Author, and to write elegant Books in his own Language; which laſt he

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he has certainly done; and he knew that more Persons could find fault with his Stile, if it had been faulty, than find out Mistakes in his Rendring of the *Greek* of *Thucydides*. Besides, the Beauty of the Author's Composition is, in all Translations, entirely lost, though the Ancients were superstitiously exact about it; and in their elegant Prose, as much almost as in their Verse. So that a Man can have but half an *Idea* of the ancient Eloquence, and that not always faithful, who judges of it without such a Skill in *Greek* and *Latin* as can enable him to read Histories, Orations and Poems in those Languages, with Ease and Pleasure. But it is time to return to my Subject.

CHAP. V.

Of Ancient and Modern Grammar.

GRammar is one of the Sciences which Sir *William Temple* says, that *(g)* *no Man ever disputed with the Ancients.* (g) Pag. 44.

As this Assertion is expressed, it is a little ambiguous: It may be understood of the Skill of the Moderns in the Gram-

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matical Analogy of *Latin* and *Greek*, or of their Skill in the *Grammar* of their Mother-Tongues. Beſides, *Grammar* may either be conſidered *Mechanically*, or *Philoſophically*. Thoſe conſider it *Mechanically*, who only examine the Idiotiſms and Proprieties of every particular Language, and lay down Rules to teach them to others. Thoſe conſider it as *Philoſophers*, who run over the ſeveral Steps, by which every Language has altered its *Idiom*; who enquire into the ſeveral Perfections and Imperfections of thoſe Tongues with which they are acquainted, and (if they are living Languages) propoſe Methods how to remedy them, or, at leaſt, remove thoſe Obſcurities which are thereby occaſioned in ſuch Diſcourſes where Truth is only regarded, and not Eloquence.

Now, this *Mechanical Grammar* of *Greek* and *Latin* has been very carefully ſtudied by Modern Criticks. *Sanctius*, *Scioppius*, and *Gerhard Voſſius*, beſides a great Number of others, who have occaſionally ſhown their Skill in their Illuſtrations of Ancient Authors, have given evident Proofs how well they underſtood the *Latin* Tongue: So have *Caninius*, *Clenard*, and abundance more, in *Greek*: Wherein they have gone upon ſure Grounds,

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Grounds, ſince, beſides a great Number of Books in both Languages, upon other Subjects, abundance of Grammatical Treatiſes, ſuch as *Scholia upon difficult Authors, Gloſſaries, Onomaſticons, Etymologicons, Rudiments of Grammar, &c.* have been preſerved, and publiſhed by skilful Men (moſt of them at leaſt) with great Care and Accuracy. So that there is Reaſon to believe, that ſome Modern Criticks may have underſtood the Grammatical Conſtruction of *Latin* as well as *Varro*, or *Ceſar*; and of *Greek* as well as *Ariſtarchus*, or *Herodian*. But this cannot be pretended to be a new Invention; for the *Grammar* of dead Languages can be only learned by Books: And ſince their Analogy can neither be increaſed, nor diminiſhed, it muſt be left as we find it.

So that when Sir *William Temple* ſays, *That no Man ever diſputed Grammar with the Ancients*; if he means, that we cannot make a new Grammar of a dead Language, whoſe Analogy has been determined almoſt Two Thouſand Years, it is what can admit of no Diſpute. But if he means, that Modern Languages have not been Grammatically examined; at leaſt, not with that Care that ſome Ancient Tongues have been; that is a Propoſition

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position which may, perhaps, be very justly questioned. For, in the first place, it ought to be considered, that every Tongue has its own peculiar Form, as well as its proper Words; not communicable to, nor to be regulated by the Analogy of another Language: Wherefore he is the best Grammarian, who is the perfectest Master of the Analogy of the Language which he is about; and gives the truest Rules, by which another Man may learn it. Next, To apply this to our own Tongue, it may be certainly affirmed, that the *Grammar* of *English* is so far our own, that Skill in the Learned Languages is not necessary to comprehend it. *Ben. Johnson* was the first Man, that I know of, that did any Thing considerable in it; but *Lilly*'s *Grammar* was his Pattern: and for want of Reflecting upon the Grounds of a Language which he understood as well as any Man of his Age, he drew it by Violence to a dead Language that was of a quite different Make; and so left his Work imperfect. After him, came Dr. *Wallis*; who examined the *English* Tongue like a Grammarian and a Philosopher at once, and showed great Skill in that Business: And of his *English Grammar* one may venture to say, That it may be set against any Thing

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Thing that is extant of the Ancients, of that kind: For, as Sir *William Temple* ſays upon another Occaſion, there is *a Strain of Philoſophy, and curious Thought*, in his previous *Eſſay of the Formation of the Sounds of Letters*; and of Subtilty in the *Grammar*, in the reducing of our Language under Genuine Rules of Art, that one would not expect in a Book of that kind.

In *France*, ſince the Inſtitution of the *French Academy*, the *Grammar* of their own Language has been ſtudied with great Care. *Iſocrates* himſelf could not be more nice in the Numbers of his Periods, than theſe *Academicians* have been in ſetling the Phraſeology, in fixing the Standard of Words, and in making their Sentences, as well as they could, numerous and flowing. Their *Dictionary*, of which a good Part is already printed; *Vangelas*'s and *Bouhours*'s *Remarks upon the French Tongue*, *Richelet*'s and *Furetiere*'s *Dictionaries*, with abundance of other Books of that kind, which, though not all written by Members of the *Academy*, yet are all Imitations of the Patterns which they firſt ſet, are Evidences of this their Care. This Sir *William Temple* ſomewhere owns: And though he there ſuppoſes, that theſe *Filers* and *Poliſhers* may

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may have taken away a great part of the Strength of the Tongue, which, in the main, is true enough, yet that is no Objection againſt their Critical Skill in *Grammar*; upon which Account only their Labours are here taken notice of. So much for the *Mechanical* Part of *Grammar*.

Philoſophical Grammar was never, that we know of, much minded by the Ancients. So that any great Performances of this ſort are to be looked upon as Modern Increaſes to the Commonwealth of Learning. The moſt conſiderable Book of that kind, that I know of, is Biſhop *Wilkins*'s *Eſſay towards a Real Character, and Philoſophical Language*: A Work, which thoſe who have ſtudied, think they can never commend enough. To this one ought to add, what may be found relating to the ſame Subject, in the Third Book of Mr. *Lock's Eſſay of Humane Underſtanding*.

CHAP.

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CHAP. VI.

Of Ancient and Modern Architecture, Statuary, and Painting.

HItherto the *Moderns* ſeem to have had very little Reaſon to boaſt of their Acquiſitions, and Improvements; Let us ſee now what they may have hereafter. In thoſe Arts, ſure, if in any, they may challenge the Preference, which depending upon great Numbers of Experiments and Obſervations, which do not every Day occurr, cannot be ſuppoſed to be brought to Perfection in a few Ages. Among ſuch, doubtleſs, *Architecture*, *Sculpture* and *Painting* may, and ought here to be reckoned; both becauſe they were extreamly valued by the *Ancients*, and do ſtill keep up their juſt Price. They are likewiſe very properly taken notice of in this Place, becauſe they have always been the Entertainments of Ingenious and Learned Men, whoſe Circumſtances would give them Opportunity to lay out Money upon them, or to pleaſe themſelves with other Men's Labours. In theſe Things, if we may take Men's Judgments in their own Profeſſions, the Ancients

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Ancients have far out-done the Moderns. The *Italians*, whoſe Performances have been the moſt conſiderable in this kind, and who, as Genuine Succeſſors of the Old *Romans*, are not apt to undervalue what they do themſelves, have, for the moſt part, given the unconteſted Pre-eminence to the Ancient *Greek* Architects, Painters and Sculptors. Whoſe Authority we ought the rather to acquieſce in, becauſe *Michael-Angelo* and *Bernini*, two wonderful Maſters, and not a little jealous of their Honour, did always ingenuouſly declare, that their beſt Pieces were exceeded by ſome of the ancient Statues ſtill to be ſeen at *Rome*.

Here therefore I at firſt intended to have left off; and I thought my ſelf obliged to reſign what I believed could not be maintained, when Monſieur *Perrault*'s *Parallel of the Ancients and Moderns* came to my Hands. His Skill in *Architecture* and *Mechanicks* was ſufficiently manifeſted long ago, in his admirable Tranſlation of, and Commentaries upon *Vitruvius*: And his long Converſation with the fineſt Pieces of Antiquity, and of theſe Later Ages, fitted him for judging of theſe Matters better than other Men. So that, though there might be great Reaſon not to agree to his Hypotheſis *of the State of Ancient*

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Ancient and Modern Eloquence and Poeſie; yet in Things of this Nature, where the *Mediums* of Judging are quite different, and where Geometrical Rules of Proportion, which in their own Nature are unalterable, go very far to determine the Queſtion, his Judgment ſeemed to be of great weight. I ſhall therefore chuſe rather to give a ſhort View of what he ſays upon theſe Subjects, than to paſs any Cenſure upon them of my own.

Of *Architecture* he ſays, "That though the Moderns have received the Knowledge of the Five Orders from the Ancients, yet if they employ it to better Purpoſes, if their Buildings be more uſeful, and more beautiful, then they muſt be allowed to be the better Architects: For it is in Architecture, as it is in Oratory; as he that lays down Rules, when and how to uſe *Metaphors*, *Hyperbole's*, *Proſopopœia's*, or any other Figures of *Rhetorick*, may very often not be ſo good an Orator as he that uſes them judiciouſly in his Diſcourſes: So he that teaches what a *Pillar*, an *Architrave* or a *Cornice* is, and that inſtructs another in the Rules of Proportion, ſo as to adjuſt all the Parts of each of the ſeveral Orders aright, may not be ſo good an Architect as he that builds" Pag. 88.

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" builds a magnificent Temple, or a no-
" ble Palace, that ſhall anſwer all thoſe
" Ends for which ſuch Structures are de-
" ſigned. That the chief Reaſon why
" the *Doric*, the *Ionic*, or the *Corinthian*
" Models have pleaſed ſo much, is, part-
" ly becauſe the Eye has been long accu-
" ſtomed to them, and partly becauſe
" they have been made uſe of by Men
" who underſtood and followed thoſe o-
" ther Rules which will eternally pleaſe,
" upon the Score of real Uſefulneſs;
" whereas the Five Orders owe their Au-
" thority to Cuſtom, rather than to Na-
Pag. 95. " ture. That theſe Univerſal Rules are;
" To make thoſe Buildings which will
" bear it, lofty and wide: In Stone-work,
" to uſe the largeſt, the ſmootheſt, and
" the eveneſt Stones: To make the Joints
" almoſt imperceptible: To place the per-
" pendicular Parts of the Work exactly
" Perpendicular, and the Horizontal Parts
" exactly Horizontal: To ſupport the
" weak Parts of the Work by the ſtrong:
" to cut Square Figures perfectly Square,
" and Round Figures perfectly Round:
" To hew the whole exactly true; and
" to fix all the Corners of the Work even-
" ly, as they ought to be. That theſe
" Rules, well obſerved, will always pleaſe
" even thoſe who never underſtood one

" ſingle

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" ſingle Term of Art: Whereas the other
" accidental Beauties, ſuch as he ſuppo-
" ſes *Doric*, *Ionic*, or *Corinthian* Work to
" be, pleaſe, only becauſe they are found
" together with theſe; though their be-
" ing the moſt conſpicuous Parts of a
" Building made them be firſt obſerved:
" From whence Men began to fanſie In-
" herent Beauties in that, which owes the
" greateſt part of its Charms to the good
" Company in which it is taken notice
" of, and ſo in time delighted, when it
" was ſeen alone. That otherwiſe it Pag. 97, 99
" would be impoſſible that there ſhould
" be ſo great a Variety in the Aſſigning
" of the Proportions of the ſeveral Or-
" ders; no two eminent Architects ever
" keeping to the ſame Meaſure, though
" they have neither ſpoiled nor leſſened
" the Beauty of their Works. That if
" we go to Particulars, we ſhall not find
" (for the purpoſe) in the *Pantheon* at
" *Rome*, which is the moſt regular, and
" the moſt magnificent ancient Building
" now extant, two Pillars of a like thick-
" neſs. That (a) the Girders of the (a) *Bandeaux de la voute du Temple.* Pag. 111. Pag. 113.
" arched Roof do not lie full upon the
" great Columns or Pilaſters; but ſome
" quite over the Cavities of the Win-
" dows which are underneath; others
" half over the Windows, and half upon

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Pag. 114. " the Columns or Pilasters, That the Mo-
" dillons of the Cornice are not exactly
" over the Middle of the Chapiters of the
" Pillars. That in the Fronts of the Piaz-
" za's, the Number of the Modillons in
" Sides of equal length is not alike: With
" several Instances of Negligence, which
" would now be thought unpardonable.
" That, generally speaking, in other Build-
" ings, their Floors were twice as thick as
" their Walls; which loaded them exceed-
Pag. 115. " ingly, to no purpose. That their Way of
" Laying Stones in Lozenges was incon-
" venient as well as troublesome, since
" every Stone so placed was a Wedge to
Pag. 117. " force those asunder on which it leaned.
" That they did not understand the nicest
" Thing in Architecture, which is, the
" Art of Cutting Stones in such a man-
" ner, as that several Pieces might be
" jointed one into another; for want of
" which, they made their Vaults of Brick
" plaster'd over; and their Architraves
" of Wood, or of one single Stone; which
" obliged them to set their Pillars closer
" to one another than otherwise had been
" necessary: Whereas, by this Art of Cut-
" ting Stone, Arches have been made al-
" most flat; Stair-Cases of a vast heighth
" have been raised, where the Spectator
" is at a loss to tell what supports them;
" whilst

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" whilſt the Stones are jointed into each
" other in ſuch a manner, that they mu-
" tually bear up themſelves, without any
" Reſt but the Wall, into which the in-
" nermoſt Stones are faſtned. That they Pag. 118.
" had not Engines to raiſe their Stones to
" any conſiderable heighth; but if the
" Work was low, they carried them up-
" on their Shoulders; if high, they rai-
" ſed ſloping Mounts of Earth level with
" their Work, by which they rolled up
" their Stones to what heighth they plea-
" ſed: For, as for the Engines for Raiſing
" of Stones in *Vitruvius*, thoſe who un-
" derſtand Mechanicks are agreed, that
" they can never be very ſerviceable.
" That it is not the Largeneſs of a Build-
" ing, but the well executing of a Noble
" Deſign, which commends an Archi-
" tect; otherwiſe the *Egyptian* Pyramids,
" as they are the greateſt, would alſo be
" the fineſt Structures in the World. And
" laſt of all, That the *French* King's Pa- Pag. 119,
" lace at *Verſailles*, and the Frontiſpiece of 120.
" the *Louvre*, diſcover more true Skill in
" Architecture of all ſorts, than any thing
" which the Ancients ever performed, if
" we may judge of what is loſt, by what
" remains."

What Monſieur *Perrault* ſays of the Ancients Way of Raiſing their Stone,

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may be confirmed by the Accounts which *Garsilasso de la Vega*, and others, give of the vast Buildings of massy Stone which the *Spaniards* found in *Peru*, upon their first Arrival. It is most certain that the *Peruans* knew not the Use of Iron; and by consequence, could make no Engines very serviceable for such a purpose. They ground their Stones one against another, to smooth them; and afterwards they raised them with Leavers: And thus, with Multitude of Hands they reared such Structures as appeared wonderful, even to Men acquainted with Modern Architecture.

Pag. 121. *Of Sculpture* he says; 'That we are to 'distinguish between entire Statues, and '*Basso Relievo's*; and in entire Statues, 'between naked and cloathed Pieces. 'The naked Images of the Ancients, as '*Hercules*, *Apollo*, *Diana*, *the Gladiators*, '*the Wrestlers*, *Bacchus*, *Laocoon*, and 'some few more, are truly admirable:

Pag. 125. 'They shew something extreamly noble, 'which one wants Words for, that is not 'to be found in Modern Work: Though 'he cannot tell whether Age does not 'contribute to the Beauty. That if some 'of the most excellent of the Modern 'Pieces should be preserved 1500 or 2000 'Years, or ting'd with some Chymical 'Water,

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'Water, that could in a ſhort time make 'them appear Antique, it is probable 'they would be viewed with the ſame Ve- 'neration which is now payed to Ancient 'Statues. That the naked Sculpture of Pag. 129.
'ſingle Figures is a very noble Art indeed, 'but the ſimpleſt of any that has ever 'charmed Mankind; not being burthen'd 'with a Multiplicity of Rules, nor need- 'ing the Knowledge of any other Art to 'compleat it; ſince a Man that has a Ge- 'nius, and Application, wants only a beau- 'tiful Model in a proper Poſture, which 'he is faithfully to copy: And therefore, 'That in the Cloathed Statues of the An- Pag. 121.
'cients, the Drapery wants much of that 'Art which is diſcernable in ſome Mo- 'dern Pieces; they could never make the 'Clothes ſit looſe to the Bodies, nor ma- 'nage the Folds ſo as to appear eaſie and 'flowing, like well-made Garments up- 'on living Bodies. That the *Baſſo Relie-* Pag. 129.
'*vo's* of the Ancients plainly ſhow, that 'the Statuaries in thoſe Days did not un- 'derſtand all the Precepts that are neceſ- 'ſary to compleat their Art; becauſe they 'never obſerved the Rules of Perſpective, 'they did not leſſen their Figures gra- 'dually, to make them ſuitable to the 'Place where they ſtood, but ſet them 'almoſt all upon the ſame Line; ſo that

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'those behind were as large, and as distinguishable, as those before; as if they 'had been purposely mounted upon Steps, 'to be seen over one another's Heads.

Pag. 130. 'That this is visible in the *Columna Trajana* at this Day, though that is the noblest ancient Performance in *Basso Relievo* 'still remaining; wherein, together with

Pag. 132. 'some very beautiful Airs of some of the 'Heads, and some very happy Postures, 'one may discern that there is scarce any 'Art in the Composition of the whole, 'no lessening of the *Relievo* in any part, 'with great Ignorance in Perspective in

Pag. 133. 'the whole. That the ancient Works in '*Basso Relievo* did not truly deserve that 'Name, being properly entire Statues, 'either sawed down perpendicularly, 'from Head to Foot, with the fore-part 'fastned, or glued to a flat Ground, or

Pag. 134. 'sunk half way in: Whereas the true 'Art consists in raising the Figures so from 'their Ground, which is of the same 'Piece, that with two or three Inches of '*Relievo*, they may appear like distinct 'Images rising out of the Ground, some 'more, some less, according to the several Distances in which they ought to be 'placed.

Pag. 143. *Of Painting*, he says; 'That three Things 'are necessary to make a perfect Picture;

'*To*

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'*To repreſent the Figures truly*; *To expreſs* '*the Paſſions naturally*; *and, To put the* '*whole judiciouſly together.* For *the Firſt*, 'It is neceſſary that all the Out-Lines be 'juſtly drawn, and that every Part be 'properly coloured. For *the Second*, It 'is neceſſary that the Painter ſhould hit 'the different Airs and Characters of the 'Face, with all the Poſtures of the Fi-'gures, ſo as to expreſs what they do, 'and what they think. *The whole is ju-'diciouſly put together*, when every ſeveral 'Figure is ſet in the Place in which we 'ſee it, for a particular Purpoſe; and the 'Colouring gradually weakned, ſo as to 'ſuit that part of the Plain in which every 'Figure appears. All which is as appli-'cable to the ſeveral Parts of a Picture 'that has but one Figure, as to the ſeve-'ral Figures in a Picture that has more. 'That if we judge of Ancient and Mo- Pag. 135.
'dern Paintings by this Rule, we may di-'vide them into three Claſſes: The Firſt 'takes in the Age of *Zeuxis*, *Apelles*, *Ti-'manthes*, and the reſt that are ſo much 'admired in Antiquity. The Second 'takes in the Age of *Raphael*, *Titian*, '*Paul Veroneſe*, and thoſe other great 'Maſters that flouriſhed in *Italy* in the 'laſt Age. The Third contains the Pain-'ters of our own Age; ſuch as *Pouſſin*,

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'*Le Brun*, and the like. That if we may judge of the Worth of the Painters of the First Classe by the Commendations which have been given them, we have Reason to say, either that their Admirers did not understand Painting well, or that themselves were not so valuable, or both. That whereas *Zeuxis* Pag. 136. is said to have painted a Bunch of Grapes so naturally, that the Birds pecked at them; Cooks have, of late Years, reached at Partridges and Capons, painted in Kitchins; which has made By-standers smile, without raising the Painter's Reputation to any great heighth. That Pag. 139. the Contention between *Protogenes* and *Apelles* shewed the Infancy of their Art: *Apelles* was wonderfully applauded for drawing a very fine Stroke upon a Table: *Protogenes* drew a Second over that, in a different Colour; which *Apelles* Pag. 141. split into two, by a Third. Yet this was not so much as what *Giotto* did, who lived in the Beginning of the Restoration of Painting in *Italy*; who drew, without Compasses, with a single Stroke of a Pencil, upon a Board, an O, so exquisitely round, that it is still proverbial among the *Italians*, when they would describe a Man that is egregiously stupid, to say, *That he is as round as*

'*the*

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'*the* O *of* Giotto. That when *Pouſſin*'s 'Hand ſhook ſo much, that he could 'ſcarce manage his Pencil, he painted 'ſome Pieces of ineſtimable Value; and 'yet very indifferent Painters would have 'divided every Line that he drew, into 'nine or ten Parts. That the *Chineſes*, Pag. 142. 'who cannot yet expreſs Life and Paſſion 'in their Pieces, will draw the Hairs of 'the Face and Beard ſo fine, that one 'may part them with the Eye from one 'another, and tell them. Though the Pag. 150. 'Ancients went much beyond all this; 'for the Remains of the ancient Painting 'diſcover great Skill in Deſigning, great 'Judgment in Ordering of the Poſtures, 'much Nobleneſs and Majeſty in the Airs 'of the Heads; but little Art, at the 'ſame time, in the Mixing of their Co-'lours, and none at all in the Perſpective, 'or the Placing of the Figures. That 'their Colouring is all equally ſtrong; 'nothing comes forward, nothing falls 'back in their Pictures; the Figures are 'almoſt all upon a Line: So that their 'Paintings appear like Pieces in *Baſ-'ſo Relievo*, coloured; all dry and un-'moveable, without Union, without Con-'nexion, and that living Softneſs which 'diſtinguiſhes Pictures from Statues in 'Marble or Copper. Wherefore, ſince the

'Paintings

'Paintings of these Ancient Masters were 'justly designed, and the Passions of eve-'ry several Figure naturally expressed, 'which are the Things that the Genera-'lity of Judges most admire, who can-'not discern those Beauties that result 'from a judicious Composition of the 'whole, so well as they can the distinct 'Beauties of the several Parts, there is no 'Wonder that *Zeuxis* and *Apelles*, and 'the other Ancient Masters, were so fa-'mous, and so well rewarded. For, of 'the three Things at first assigned, as ne-'cessary to a perfect Painter, true Draw-'ing, with proper Colouring, affect the 'Senses; natural Expressing of the Mo-'tions of the Soul move the Passions;
Pag. 146. 'whereas a Judicious Composition of the 'whole, which is discernable in an Art-'ful Distribution of Lights and Shades, 'in the gradual Lessening of Figures, ac-'cording to their respective Places, in ma-'king every Figure answer to that parti-'cular Purpose which it is intended to re-'present, affects the Understanding only; 'and so, instead of Charming, will ra-'ther disgust an unskilful Spectator.
Pag. 147. 'Such a Man, and under this Head al-'most all Mankind may be comprehend-'ed, will contentedly forgive the grossest 'Faults in Perspective, if the Figures are

'but

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'but very prominent, and the View not 'darkned by too much Shade; which, 'in their Opinion, ſpoils all Faces, eſpe- 'cially of Friends, whoſe Images chiefly 'ſuch Men are deſirous to ſee.

When he compares the Paintings of *Raphael* and *Le Brun* together, he obſerves, 'That *Raphael* ſeems to have had Pag. 159. 'the greater Genius of the two; that there 'is ſomething ſo Noble in his Poſtures, 'and the Airs of his Heads; ſomething 'ſo juſt in his Deſigns, ſo perfect in the 'Mixture of his Colours, that his St. *Michael* will always be thought the firſt 'Picture in the World, unleſs his *H. Family* ſhould diſpute Precedency with it. In ſhort, he ſays, That if we conſi- Pag. 160. 'der the Perſons of *Raphael* and *Le Brun*, '*Raphael* perhaps may be the greater 'Man: But if we conſider the Art, as a 'Collection of Rules, all neceſſary to be 'obſerved to make it perfect, it appears 'much more compleat in Monſieur *Le Brun*'s Pieces: For *Raphael* underſtood 'ſo little of the gradual Leſſening of 'Light, and Weakning of Colours, which 'is cauſed by the Interpoſition of the Air, 'that the hindmoſt Figures in his Pieces 'appear almoſt as plain as the foremoſt; 'and the Leaves of diſtant Trees, almoſt 'as viſible as of thoſe near at hand; and

'the

'the Windows of a Building four Leagues 'off may all be counted as eaſily as of one 'that is within twenty Paces. Nay, he 'cannot tell whether ſome part of that 'Beauty, now ſo peculiar to *Raphael*'s 'Pieces, may not, in a great Meaſure, 'be owing to Time, which adds a real 'Beauty to good Paintings. For, in 'Works of this kind, as in New-killed 'Meat, or New-gathered Fruit, there is 'a Rawneſs and Sharpneſs, which Time 'alone concocts and ſweetens, by morti-'fying that which has too much Life, by 'weakning that which is too ſtrong, and 'by mixing the Extremities of every Co-
Pag. 161. 'lour entirely into one another. So that 'no Man can tell what will be the Beauty 'of *Le Brun*'s *Family of Darius*, *Alexan-'der's Triumph*, *the Defeat of Porus*, and 'ſome other Pieces of equal Force, when 'Time ſhall have done her Work, and 'ſhall have added thoſe Graces which are 'now ſo remarkable in the *St. Michael*, 'and the *H. Family*. One may already 'obſerve, that Monſieur *Le Brun*'s Pieces 'begin to ſoften; and that Time has, in 'part, added thoſe Graces which it alone 'can give, by ſweetning what was left on 'purpoſe, by the judicious Painter, to a-'muſe its Activity, and to keep it from 'the Subſtance of the Work'. Thus far Monſieur *Perrault*. Whe-

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Whether his Reaſonings are juſt, I dare not determine: Thus much may very probably be inferred, That *in theſe Things alſo* the World does not decay ſo faſt as Sir *William Temple* believes; and that *Pouſſin*, *Le Brun* and *Bernini* have made it evident by their Performances in Painting and Statuary; *(h) That we have had Maſters in both theſe Arts, who have deſerved a Rank with thoſe that flouriſhed in the laſt Age, after they were again reſtored to theſe Parts of the World.* (h) Pag. 52.

CHAP. VII.

General Reflections relating to the following Chapters: With an Account of Sir William Temple's *Hypotheſis of the Hiſtory of Learning.*

IF the bold Claims of confident and numerous Pretenders might, becauſe of their Confidence and Numbers, be much relied on, it were an eaſie Thing to determine the preſent Queſtion, without any further Trouble. The Generality of the Learned have given *the Ancients* the Preference

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Preference in those Arts and Sciences which have hitherto been considered: But for the Precedency in those Parts of Learning which still remain to be enquired into, *the Moderns* have put in their Claim, with great Briskness. Among this Sort, I reckon *Mathematical* and *Physical Sciences*, considered in their largest Extent. These are Things which have no Dependence upon the Opinions of Men for their Truth; they will admit of fixed and undisputed *Mediums* of Comparison and Judgment: So that, though it may be always debated, who have been the best Orators, or who the best Poets; yet it cannot always be a Matter of Controversie, who have been the greatest *Geometers*, *Arithmeticians*, *Astronomers*, *Musicians*, *Anatomists*, *Chymists*, *Botanists*, or the like; because a fair Comparison between the Inventions, Observations, Experiments and Collections of the contending Parties must certainly put an End to the Dispute, and give a more full Satisfaction to all Sides.

The Thing contended for on both Sides is, the *Knowledge of Nature*; what the Appearances are which it exhibits, and how they are exhibited; thereby to show how they may be enlarged, and diversified, and Impediments of any sort removed.

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ved. In order to this, it will be neceſſary, (1.) To find out all the ſeveral Affections and Properties of Quantity, abſtractedly conſidered; with the Proportions of its Parts and Kinds, either ſeverally conſidered, or compared with, or compounded with one another; either as they may be in Motion, or at Reſt. This is properly the *Mathematician*'s Buſineſs. (2.) To collect great Numbers of Obſervations, and to make a vaſt Variety of Experiments upon all ſorts of Natural Bodies. And becauſe this cannot be done without proper Tools, (3.) To contrive ſuch Inſtruments, by which the Conſtituent Parts of the Univerſe, and of all its Parts, even the moſt minute, or the moſt remote, may lie more open to our View; and their Motions, or other Affections, be better calculated and examined, than could otherwiſe have been done by our unaſſiſted Senſes. (4.) To range all the ſeveral Species of Natural Things under proper Heads; to aſſign fit Characteriſticks, or Marks, whereby they may be readily found out, and diſtinguiſhed from one another. (5.) To adapt all the Catholick Affections of Matter and Motion to all the known Appearances of Things, ſo as to be able to tell how Nature works; and, in ſome particular Caſes, to command

mand her. This will take in *Aſtronomy*, *Mechanicks*, *Opticks*, *Muſick*, with the other *Phyſico-Mathematical* and *Phyſico-Mechanical* Parts of Knowledge; as alſo, *Anatomy*, *Chymiſtry*, with the whole Extent of *Natural Hiſtory*. It will help us to make a juſt Compariſon between the *Ancient* and *Modern Phyſicks*; that ſo we may certainly determine who Philoſophized beſt, *Ariſtotle* and *Democritus*, or Mr. *Boyle* and Mr. *Newton*.

In theſe Things therefore the Compariſon is to be made, wherein one can go no higher than the Age of *Hypocrates*, *Ariſtotle* and *Theophraſtus*, becauſe the Writings of the Philoſophers before them are all loſt. It may therefore be plauſibly objected, that this is no fair Way of Proceeding, becauſe the *Egyptians* and *Chaldeans* were famous for very many Parts of real Learning long before; from whom *Pythagoras*, *Thales*, *Plato*, and all the other *Grecian* Philoſophers, borrowed what they knew. This Sir *William Temple* inſiſts at large upon; ſo that it will be neceſſary to examine the Claims of theſe Nations to Univerſal Learning: In doing of which, I ſhall follow Sir *William Temple*'s Method; and firſt give a ſhort Abſtract of his Hypotheſis, and then enquire how far it may be relied on.

Sir

Sir *William Temple* tells us, That the chiefeſt Argument that is produced in behalf of the Moderns, is; '*(i)* That they 'have the Advantage of the Ancients 'Diſcoveries to help their own: So 'that, like Dwarfs upon Giants Shoul-'ders, they muſt needs ſee farther than 'the Giants themſelves." To weaken this, we are told, '*(k)* That thoſe whom 'we call Ancients, are Moderns, if com-'pared to thoſe who are ancienter than 'they: And that there were vaſt Lakes 'of Learning in *Egypt*, *Chaldea*, *India* 'and *China*; where it ſtagnated for many 'Ages, till the *Greeks* brought Buckets, 'and drew it out."

(i) Pag. 5.

(k) Pag. 6—10.

The Queſtion which is firſt to be asked here, is, *Where are the Books and Monuments wherein theſe Treaſures were depoſited for ſo many Ages?* And becauſe they are not to be found, Sir *William Temple* makes a Doubt, *(l) Whether Books advance any other Science, beyond the particular Records of Actions, or Regiſters of Time.* He may reſolve it ſoon, if he enquires how far a Man can go in Aſtronomical Calculations, for which the *Chaldeans* are ſaid to be ſo famous, without the Uſe of Letters. The *Peruan* Antiquities, which he there alledges, for Twelve or Thirteen Generations, from

(l) Pag. 8.

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Mango Capac, to *Atabualpa*, were not of above Five Hundred Years ſtanding. The *Mexican* Accounts were not much older; and yet theſe, though very rude, needed Helps to be brought down to us. The *Peruan* Conveyances of Knowledge, according to *Garcilaſſo de la Vega*, were not purely Traditionary, but were Fringes of Cotton, of ſeveral Colours, tied and woven with a vaſt Variety of Knots, which had all determinate Meanings; and ſo ſupplied the Uſe of Letters, in a tolerable Degree; And the *Mexican* Antiquities were preſerved, after a ſort, by Pictures; of which we have a Specimen in *Purchas*'s *Pilgrim*. So that when Sir *William Temple* urges the Traditions of theſe People, to prove that Knowledge may be conveyed to Poſterity without Letters, he proves only what is not diſputed, namely, That Knowledge can be imperfectly conveyed to Poſterity without Letters; not that Tradition can preſerve Learning as well as Books, or ſomething equivalent.

But ſince Sir *William Temple* lays no great Weight upon this Evaſion, I ought not to inſiſt any longer upon it. He ſays (m) therefore, 'That it is a Queſtion, 'whether the Invention of Printing has 'multiplied Books, or only the Copies of 'them;

(m) Pag. 6

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'them; since, if we believe that there 'were 600000 Books in the *Ptolemean* 'Library, we shall hardly pretend to 'equal it by any of ours, nor perhaps by 'all put together; that is, we shall be 'scarce able to produce so many Originals 'that have lived any Time, and thereby 'given Testimony of their having been 'thought worth preserving.' All this, as it is urged by Sir *William Temple*, is liable to great Exception. For, (1.) If we should allow that there is no Hyperbole in the Number of Books in the *Ptolemean* Library, yet we are not to take our Estimate by our Way of Reckoning. Every Oration of *Demosthenes* and *Isocrates*, every Play of *Æschylus* or *Aristophanes*, every Discourse of *Plato* or *Aristotle*, was anciently called a Volume. This will lessen the Number to us, who take whole Collections of every Author's Works in one Lump; and call them accordingly in our Catalogues, if printed together, but by one Title. (2.) Sir *William Temple* seems to take it for granted, that all these Books were *Originals*; that is to say, Books *worth preserving*; which is more than any Man can now prove. I suppose he himself believes that there were Ancients of all Sorts and Sizes, as well as there are Moderns now. And

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he that raiſes a Library, takes in Books of all Values; ſince bad Books have their Uſes to Learned Men, as well as good ones. So that, for any Thing we know to the contrary, there might have been in this *Alexandrian* Library a great Number of *(n) Scribblers, that, like Muſhrooms or Flies, are born and die in ſmall Circles of Time.* (3.) The World can make a better Judgment of the Value of what is loſt, at leaſt, as it relates to the preſent Enquiry, than one at firſt View might perhaps imagine. The loſt Books *of the Antiquity of ſeveral Nations, of their Civil Hiſtory, of the Limits of their ſeveral Empires and Commonwealths, of their Laws and Manners*, or of any Thing immediately relating to any of theſe, are not here to be conſidered, becauſe it cannot be, pretended that the Moderns could know any of theſe Things, but as they were taught. So neither is what may have related to *Ethicks*, *Politicks*, *Poeſie* and *Oratory* here to be urged, ſince in thoſe Matters, the Worth of Ancient Knowledge has already been aſſerted. So that one is only to enquire what and how great the Loſs is of all thoſe Books upon Natural or Mathematical Arguments, which were preſerved in the *Alexandrian*, *Aſiatick* and *Roman* Libraries,

(n) Ibid.

or

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or mentioned in the Writings of the Ancient Philoſophers and Hiſtorians. By which Deduction, the former Number will be yet again conſiderably leſſened.

Now, a very true Judgment of Ancient Skill in Natural Hiſtory may be formed out of *Pliny*, whoſe Extracts of Books, ſtill extant, are ſo particular for the preſent Purpoſe, that there is Reaſon to believe they were not made careleſly of thoſe that are loſt. *Galen* ſeems to have read whatever he could meet with relating to Medicine, in all its Parts: And the Opinions of Abundance of Authors, whoſe Names are no where elſe preſerved, may be diſcovered out of his Books; of the famous ones eſpecially; whom at every Turn he either contradicts, or produces to fortifie his own Aſſertions. *Ptolemee* gives an Account of the old Aſtronomy in his *Almageſt*. Very many Particulars of the Inventions and Methods of Ancient Geometers are to be found in the Mathematical Collections of *Pappus*. The Opinions of the different Sects of Philoſophers are well enough preſerved in the entire Treatiſes of the ſeveral Philoſophers who were of their Sects; or in the Diſcourſes of others, who occaſionally or expreſly confute what they ſay. So that I am apt to think, that the Philoſophical and Mathe-

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matical Learning of the Ancients is better conveyed to us than the Civil; the Books which treated of those Subjects suiting better the Genius's of several Men, and of several Nations too: For which Reason the *Arabs* translated the most considerable *Greek* Books of this kind; as, *Euclid*, *Apollonius*, *Aristotle*, *Epictetus*, *Geber*, and Abundance more, that had written of Philosophy or Mathematicks, into their own Language; whilst they let Books of Antiquity and Civil History lie unregarded.

Sir *William Temple*'s next Enquiry is, From whence both the Ancients and Moderns have received their Knowledge? His Method does not seem to be very natural, nor his Question very proper, since, if Discoveries are once made, it is not so material to know who taught the several Inventors, as what these Inventors first taught others. But setting that aside, the Summ of what he says, in short, is this:

(o) Pag. 11, 12.

'(o) The Moderns gather all their 'Learning out of Books in Universities; 'which are but dumb Guides, that can 'lead Men but one Way, without being 'able to set them right if they should 'wander from it. These Books, besides, 'are very few; the Remains of the Wri'tings of here and there an Author, that

'wrote

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'wrote from the Time of *Hippocrates*, to *M. Antoninus*, in the Compaſs of Six or Seven Hundred Years: Whereas *Thales* and *Pythagoras* took another ſort of a Method; *Thales* acquired his Knowledge in *Egypt*, *Phœnicia*, *Delphos* and *Crete*; (p) *Pythagoras* ſpent Twenty Two Years in *Egypt*, and Twelve Years more in *Chaldea*, and then returned, laden with all their Stores; and not contented with that, went into *Ethiopia*, *Arabia*, *India* and *Crete*; and viſited *Delphos*, and all the renowned Oracles in the World.

(p) Pag. 13, 14, 15.

'(q) Leſt we ſhould wonder why *Pythagoras* went ſo far, we are told, that the *Indian Brachmans* were ſo careful to educate thoſe who were intended for Scholars, that as ſoon as the Mothers found themſelves with Child, much Thought and Diligence was employed about their Diet and Entertainment, to furniſh them with pleaſant Imaginations, to compoſe their Mind and their Sleeps with the beſt Temper, during the Time that they carried their Burthen. It is certain that they muſt needs have been very learned, ſince they were obliged to ſpend Thirty Seven Years in getting Inſtruction: Their Knowledge was all Traditional; they thought the World was round, and made by a Spi-

(q) Pag. 16, 17.

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'rit; they believed the Tranſmigration
'of Souls; and they eſteemed Sickneſs
'ſuch a Mark of Intemperance, that
'when they found themſelves indiſpoſed,
'they died out of Shame and Sullenneſs,
'though ſome lived an Hundred and Fif-
(r) Pag. 22, 23. 'ty or Two Hundred Years. *(r)* Theſe
'*Indians* had their Knowledge, in all
'probability, from *China*, a Country
'where Learning had been in Requeſt
'from the Time of *Fohius*, their firſt
'King. It is to be preſumed, that they
'communicated of their Store to other
'Nations, though they themſelves have
'few Foot-ſteps of it remaining, beſides
'the Writings of *Confucius*, which are
'chiefly Moral and Political; becauſe one
'of their Kings, who deſired that the
'Memory of every Thing ſhould begin
'with himſelf, cauſed Books of all ſorts,
'not relating to Phyſick and Agriculture,
'to be deſtroyed.

(f) Pag. 21. '*(f)* From *India*, Learning was car-
'ried into *Ethiopia* and *Arabia*; thence,
'by the Way of the *Red Sea*, it came in-
'to *Phœnicia*; and the *Egyptians* learnt it
'of the *Ethiopians*.

This is a ſhort Account of the Hiſtory of Learning, as Sir *William Temple* has deduced it from its moſt ancient Beginnings. The Exceptions which may be made

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made againſt it are many, and yet more againſt the Concluſions which he draws from it: For, though it be certain that the *Egyptians* had the Grounds and Elements of moſt parts of real Learning among them earlier than the *Greeks*, yet that is no Argument why the *Grecians* ſhould not go beyond their Teachers, or why the Moderns might not out-do them both.

Before I examine Sir *William Temple*'s Scheme, Step by Step, I ſhall offer, as the Geometers do, ſome few Things as *Poſtulata*, which are ſo very plain, that they will be aſſented to as ſoon as they are propoſed. (1.) That all Men who make a Myſtery of Matters of Learning, and induſtriouſly oblige their Scholars to conceal their Dictates, give the World great Reaſon to ſuſpect, that their Knowledge is all Juggling and Trick. (2.) That he that has only a Moral Perſuaſion of the Truth of any Propoſition, which is capable of Natural Evidence, cannot ſo properly be eſteemed the Inventor, or the Diſcoverer rather, of that Propoſition, as another Man, who, tho' he lived many Ages after, brings ſuch Evidences of its Certainty, as are ſufficient to convince all competent Judges; eſpecially when his Reaſonings are founded upon

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upon Obſervations and Experiments drawn from, and made upon the Things themſelves. (3.) That no Pretences to greater Meaſures of Knowledge, grounded upon Account of Long Succeſſions of Learned Men in any Country, ought to gain Belief, when ſet againſt the Learning of other Nations, who make no ſuch Pretences, unleſs Inventions and Diſcoveries anſwerable to thoſe Advantages, be produced by their Advocates. (4.) That we cannot judge of Characters of Things and Perſons at a great Diſtance, when given at Second-hand, unleſs we knew exactly how capable thoſe Perſons, from whom ſuch Characters were firſt taken, were to paſs a right Judgment upon ſuch ſubjects; and alſo the particular Motives that biaſſed them to paſs ſuch Cenſures. If *Archimedes* ſhould, upon his own Knowledge, ſpeak with Admiration of the *Egyptian* Geometry, his Judgment would be very conſiderable: But if he ſhould ſpeak reſpectfully of it, only becauſe *Pythagoras* did ſo before him, it might, perhaps, ſignifie but very little. (5.) That exceſſive Commendations of any Art or Science whatſoever, as alſo of the Learning of any particular Men or Nations, only prove that the Perſons who give ſuch Characters never heard of any

Thing

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Thing or Perſon that was more excellent in that Way; and therefore that Admiration may be as well ſuppoſed to proceed from their own Ignorance, as from the real Excellency of the Perſons or Things; unleſs their reſpective Abilities are otherwiſe known.

CHAP. VIII.

Of the Learning of Pythagoras, *and the moſt Ancient Philoſophers of* Greece.

IN my Enquiries into the Progreſs of Learning during its obſcurer Ages, or thoſe, at leaſt, which are ſo to us at this Diſtance, I ſhall begin with the Accounts which are given of the Learning of *Pythagoras*, rather than thoſe of the more Ancient *Grecian* Sages; becauſe his School made a much greater Figure in the World, than any of thoſe which preceded *Plato* and *Ariſtotle*. In making a Judgment upon the Greatneſs of his Performances, from the Greatneſs of his Reputation, one ought to conſider how near to his Time thoſe lived, whoſe expreſs Relations of his Life are the oldeſt we have.

Diogenes

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Diogenes Laërtius is the ancienteſt Author extant, that has purpoſely written the Life of *Pythagoras*: According to *Menagius*'s Calculations, he lived in *M. Antoninus*'s Time: And all that we learn from *Diogenes* is only, that we know very little certainly about *Pythagoras*. He cites, indeed, great Numbers of Books; but thoſe ſo very diſagreeing in their Relations, that a Man is confounded with their Variety. Beſides, the *Grecians* magnified every Thing that they commended, ſo much, that it is hard to gueſs how far they may be believed when they write of Men and Actions at any Diſtance from their own Time. *Græcia Mendax* was almoſt proverbial amongſt the *Romans*. But by what appears from the Accounts of the Life of *Pythagoras*, he is rather to be ranked among the Lawgivers, with *Lycurgus* and *Solon*, and his own two Diſciples, *Zaleucus* and *Charondas*, than amongſt thoſe who really carried Learning to any conſiderable heighth. Therefore, as ſome other Legiſlators had, or pretended to have, Super-natural Aſſiſtances, that they might create a Regard for their Laws in the People to whom they gave them; ſo *Pythagoras* found out ſeveral Equivalents, which did him as much Service. He is ſaid, indeed, to have

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have lived many Years in *Egypt*, and to have converſed much with the Philoſophers of the *Eaſt*; but if he invented the XLVIIth. Propoſition in the Firſt Book of *Euclid*, which is unanimouſly aſcribed to him by all Antiquity, one can hardly have a profound Eſteem for the Mathematical Skill of his Maſters. It is, indeed, a very noble Propoſition, the Foundation of Trigonometry, of univerſal and various Uſe in thoſe curious Speculations of Incommenſurable Numbers; which his Diſciples from him, and from them the *Platoniſts*, ſo exceedingly admired. But this ſhews the Infancy of Geometry in his Days, in that very Country which claims the Glory of Inventing it to her ſelf. It is probable, indeed, that the *Egyptians* might find it out; but then we ought alſo to take notice, that it is the only very conſiderable Inſtance of the real Learning of *Pythagoras* that is preſerved. Which is the more obſervable, becauſe the *Pythagoreans* paid the greateſt Reſpect to their Maſter, of any Sect whatſoever; and ſo we may be ſure that we ſhould have heard much more of his Learning, if much more could have been ſaid: And though the Books of *Hermippus* and *Ariſtoxenus (t)* are loſt, yet *Laërtius*, who had read them, and *Porphyry* and *Jamblichus*,

(t) *Two very conſiderable Writers of Pythagoras's Life.*

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thus, Men of great Reading, and diffuſe Knowledge, who, after *Diogenes*, wrote the Life of the ſame *Pythagoras*, would not have omitted any material Thing of that kind, if they had any where met with it.

Amongſt his other Journies, Sir *William Temple* mentions *Pythagoras*'s Journy to *Delphos* (*u*). Here, by the by, I muſt beg leave to put Sir *William Temple* in mind of a ſmall Miſtake that he commits in the Word *Delphos*, both here, and *pag.* 13. when he ſpeaks of *Thales*. In both Places he ſays that *Pythagoras* and *Thales* travelled to *Delphos*: He might as well have ſaid, that they travelled to *Ægyptum*, and *Phœniciam*, and *Cretam*. It ſhould be printed therefore, in his next Edition, to *Phœnicia*, and *Delphi*: For the *Engliſh* uſe the Nominative Caſes of old Names, when they expreſs them in their Mother Tongue. But ſetting that aſide, what this makes to his purpoſe, is not eaſie to gueſs. *Apollo*'s Prieſteſſes are not famous for diſcovering Secrets in Natural or Mathematical Matters; and as for Moral Truths, they might as well be known without going thither to fetch them. *Van Dalen*, in his Diſcourſes of the Heathen Oracles, has endeavoured to prove, that they were only

(*u*) Pag. 15.

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only Artifices of the Priests, who gave such Answers to Enquirers as they desired, when they had either Power or Wealth to back their Requests. If *Van Dale*'s Hypothesis be admitted, it will strengthen my Notion of *Pythagoras* very much; since when he did not care to live any longer in *Samos*, because of *Polycrates*'s Tyranny, and was desirous to establish to himself a lasting Reputation for Wisdom and Learning amongst the ignorant Inhabitants of *Magna Græcia*, where he setled upon his Retirement, he was willing to have them think that *Apollo* was of his Side. That made him establish the Doctrine of Transmigration of Souls, which he brought with him out of *India*, that so those *Italians* might think that he had a certain Reminiscence of Things past, since his first Stage of Life, and the Beginning of the World; and upon that Account admire him the more: For *Laertius* (w) says, that he pretended to remember every Thing that he had done formerly, whilst he was in those other Bodies; and that he received this as an especial Favour from *Mercury*, who gave him his Choice of whatsoever he desired, except Immortality. (x) Hence also he obliged his Scholars to go through a Trial of Five Years, to learn

(w) Vita Pythag. §. 4.

(x) Ibid. §. 10.

learn Obedience by Silence: And that afterwards it was granted to ſome few, as a particular Favour, to be admitted into his Preſence. Theſe Things tended very much to impreſs a Veneration of his Perſon upon his Scholars, but ſignified nothing to the Advancement of Learning; yea, rather hindred it. Thoſe that live in the End of the World, *(y)* when every Thing, according to Sir *William Temple*, is in its Declenſion, know no Way ſo effectual to promote Learning, as much Converſation and Enquiry; and, which is more, they have no *Idea* how it can be done without them. The Learned Men of the preſent Age pretend to no Acquaintance with *Mercury* or *Apollo*, and can do as little in Natural Knowledge by ſuch a Sham-Revelation, as they can by Reminiſcence. If a Man ſhould, for Five Years together, read Lectures, to one that was not allowed to make Pauſes, or ask Queſtions; another Man, in the ordinary Road, by Books and Profeſſors, would learn more, at leaſt, to much better purpoſe, in Six Months, than he could in all that Time.

(y) Pag. 53.

Pythagoras was, without queſtion, a wiſe Man, well skilled in the Arts of Civil Prudence; by which he appeaſed great Diſturbances in thoſe *Italian* Commo-

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monwealths: He had much more Knowledge, than any Man of that Age in *Italy*, and knew how to make the moſt of it. He took great Delight in Arithmetical Speculations, which, as *Galileo* (z), not improbably, gueſſes, he involved in Myſteries, that ſo ignorant People might not deſpiſe him for buſying himſelf in ſuch abſtruſe Matters, which they could not comprehend; and if they could have comprehended, did not know to what Uſe to put them. He took a ſure Way to have all his Studies valued, by obliging his Scholars to reſign up their Underſtandings to his Authority and Dictates. The great Simplicity of his Manners, with the Wiſdom of his Axioms and Symbols charmed an ignorant Age, which found real Advantages by following his peaceful Meaſures; much above thoſe that were formerly procured by Rapin and Violence. This ſeems to be a true Account of *Pythagoras*, in the Hiſtory of whoſe Reputation, there is nothing extraordinary, ſince Civilizers of Nations have always been as much magnify'd as the Inventors of the moſt uſeful Arts: But one can no more conclude from thence, That *Pythagoras* knew as much as *Ariſtotle* or *Democritus*, than that Friar *Bacon* was as great a Mathematician as

(z) Syſtem. Coſmic.

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Dr. *Barrow*, or Mr. *Newton*, becauſe he knew enough to be thought a Conjurer in the Age in which he lived, and no deſpicable Perſon in any other.

But it may not be amiſs to give a Taſt of ſome of the *Pythagorean* Notions; ſuch, I mean, as they firſt ſtarted in *Europe*, and chiefly valued themſelves upon. Of this Sort, were their Arithmetical Speculations. By them they pretended to explain the Cauſes of Natural Things. The following Account of their Explication of Generation is taken out of *Cenſorinus* and *Ariſtides*.

'Perfect Animals are generated in two 'diſtinct Periods of Time; ſome in Seven 'Months, ſome in Nine. Thoſe Gene-'rations that are compleated in Seven 'Months proceed in this Order: In the 'Firſt Six Days after Conception the 'Humour is Milky; in the next Eight 'it is turned into Blood; which Number '8 bears the Proportion of 1½ to 6; in 'Nine Days more it becomes Fleſh; 9 is 'in a Seſcuple Proportion to 6; in Twelve 'Days more the Embryo is formed; 12 'is double to 6: Here then are theſe Sta-'ges, 6, 8, 9, 12; 6 is the Firſt perfect 'Number, becauſe it is the Sum of 1, 2, '3, the only Numbers by which it can 'be divided: Now if we add theſe Four 'Numbers

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'Numbers 6, 8, 9, 12 together, the 'Sum is 35, which multiply'd by 6 makes '210, the Number of Days from the 'Conception to the Birth; which is juſt 'Seven Months, allowing 30 Days to a 'Month. A like Proportion muſt be ob-'ſerved in the larger Period of Nine 'Months, only 10 the Sum of 1, 2, 3, 4 'added together, muſt be added to 35, 'which makes 45; that multiply'd by 6 'gives 270, or Nine Times 30, the Num-'ber of Days in larger Births.

If theſe fine Notions are compar'd with Dr. *Harvey*'s upon the ſame Subject, no doubt but we ſhall all be Converts to Sir *William Temple*'s Opinion, and make a vaſt Difference between the poor Obſervations of theſe later Ages, and the ſublime Flights of the Ancients.

Now tho' abſtracted Mathematical Theories, which cannot be reliſhed by one that has not a tolerable Skill in Mathematicks before, might, perhaps, prudently be concealed from the Vulgar, by the *Pythagorean* School; and in their Stead, ſuch grave Jargon as this impoſed upon them; yet even that ſhews how little Knowledge of Nature they could pretend to. Men that aim at Glory, will omit no probable Methods to gain it, that lie in their Way; and ſolid Diſcove-

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ries of a real Inſight into Nature, would not only have been eternally true, but have charmed Mankind at another Rate, than ſuch dry ſapleſs Notions as ſeem at firſt View to have ſomething of Subtilty; but upon a Second Reflection, appear vain and ridiculous.

From *Pythagoras* I ſhall go on to the Ancient Sages (*a*), *who were ſo learned in natural Philoſophy, that they foretold not only Eclipſes in the Heavens, but Earthquakes at Land, and Storms at Sea, great Droughts, and great Plagues, much Plenty or much Scarcity of certain Sorts of Fruits or Grain, not to mention the magical Powers attributed to ſeveral of them, to allay Storms, to raiſe Gales, to appeaſe Commotions of People, to make Plagues ceaſe.*

(a) pag. 28.

One of the ancienteſt of theſe was *Thales*. He was ſo deeply skilled in Aſtronomy, that by the Sun's Annual Courſe he found out the Equinoxes and Solſtices. He is ſaid alſo firſt to have foretold Eclipſes; ſome Geometrical Properties of Scalene Triangles are aſcribed to him, and challenged by *Euphorbus*: Nice we are ſure they were not, becauſe the Theorem of *Pythagoras* was not then found out.

When Sir *William Temple* extolled the Skill of theſe *Ancient Sages*, in foretelling Change of Weather, he ſeems to have forgot

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forgot that he was in *England*, and fanſied that theſe Old Philoſophers were there too. The Climates of *Aſia Minor*, and *Greece*, are not ſo various as ours; and at ſome ſtated Times of the Year, of which the recurrent Winds give them conſtant Warning, they are often troubled with Earthquakes, and always with violent Tempeſts: So that by the Conjectures that we are here able to make of the Weather at ſome particular Seaſons, though we labour under ſo great Diſadvantages, we may eaſily gueſs how much certainer Predictions may be made by curious Men in ſerener and more regular Climates; which will take off from that Admiration, that otherwiſe would be paid to thoſe profound Philoſophers, even though we ſhould allow that all thoſe Stories which are told of their Skill are exactly true.

Beſides, there is Reaſon to believe that we have the Reſult of all the Obſervations of theſe Weather-wiſe Sages in *Aratus*'s *Dioſemia* and *Virgil*'s *Georgic's*; ſuch as thoſe upon the Snuffs of Candles, the croaking of Frogs, and many others quite as notable as the Engliſh Farmer's *Living Weather-Glaſs, his Red Cow that prick'd up her Tail*, an Infallible Preſage of a coming Shower.

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Sir *William Temple*'s Method leads me now to consider, what Estimate ought to be made of the Learning of those Nations, from which he derives all the Knowledge of these Ancient *Greeks*: I shall only therefore give a short Specimen of those Discoveries, with which these Ancient Sages enriched the Ages in which they lived, as I have already done of the *Pythagoreans*, and then proceed.

Diogenes Laërtius informs us of *Empedocles*'s (*b*) Skill in Magick, by the Instance of his stopping those pestilential Vapours that annoy'd his Town of *Agrigentum*. He took some Asses, and flea'd them, and hung their Hides over those Rocks that lay open to the *Etesian* Winds, which hindred their Passage, and so freed the Town. He tells another Story of *Democritus* (*c*), That he was so nice in his Observations, that he could tell whether a Young Woman were a Virgin, by her Looks, and could find it out, though she had been corrupted but the Day before; and he knew by looking upon it, that some Goats Milk that was brought him, was of a Black Goat that had had but one Kid.

(b) Vitâ Empedoclis, §. 60.

(c) Vit. Democriti, §. 42.

These are Instances very seriously recorded by grave Authors of the *Magical Wisdom* of the Ancients; that is, as Sir

Sir *William Temple* defines it, of that (*d*) *excelling Knowledge of Nature, and the various Powers and Qualities in its several Productions, and the Application of certain Agents to certain Patients, which by Force of some peculiar Qualities, produce Effects very different from what fall under vulgar Observation and Comprehension.*

(d) Pag. 46.

CHAP. IX.

Of the History and Mathematicks of the Ancient Egyptians.

FRom these *Ancient Sages* Sir *William Temple* goes to the Nations, from which they received their Knowledge, which are, *Egypt*, *Chaldea*, *Arabia*, *India* and *China*; only he seems to invert the Order, by pretending that *China* and *India* were the Original Fountains from which Learning still ran Westward; I shall speak of them in the Order in which I have named them, because the Claims of the *Egyptians* and *Chaldeans* having a greater Foundation in Ancient History, deserve a more particular Examination.

It must be owned, That the Learning which was in the World before the *Grecian*

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cian Times was almoſt wholly confined to the *Egyptians*, excepting what was amongſt the *Iſraelites*: And whoſoever does but conſider how difficult it is to lay the firſt Foundations of any Science, be they never ſo ſmall, will allow them great Commendation; which if the Advocates for them had been contented with, there had been an End of the Controverſie. Inſtead of that, all that has ſince been added to their Foundations, has been equally challenged as originally due to them, or at leaſt once known by them, by (e) *Olaus Borrichius*, and ſeveral others long before Sir *William Temple*, wrote upon this Argument.

(e) In Hermete Ægyptio.

Before I enter upon this Queſtion, I ſhall deſire that one Thing may be taken Notice of; which is, That the *Egyptians* anciently pretended to ſo great Exactneſs, that every Failure is more juſtly imputable to them, than to other Nations; not only their Hiſtory was ſo carefully look'd after, that there was a College of Prieſts ſet up on purpoſe, whoſe chief Buſineſs it was ſucceſſively to preſerve the remarkable Matters of Fact that occurred in their own Ages, and tranſmit them undiſputed to Poſterity, but alſo, there was anſwerable Care taken to propagate and preſerve all other Parts of uſeful Learning:

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Learning: All their Inventions in *Phyſick*, in *Mathematicks*, in *Agriculture*, in *Chymiſtry*, are ſaid to have been inſcribed on Pillars, which were preſerved in their Temples; whereby not only the Memory of the things themſelves was leſs liable to be loſt; but Men were further encouraged to uſe their utmoſt Diligence in finding out things that might be of publick Advantage, when they were certain of getting Immortality by theſe Inventions. This generous Cuſtom was the more to be applauded, becauſe every Man was confined to one particular Part of Learning, as his chief Buſineſs; that ſo nothing might eſcape them. One was Phyſician for the *Eyes*, another for the *Heart*, a Third for the *Head* in general, a Fourth for *Chirurgical* Applications, a Fifth for *Womens Diſeaſes*, and ſo forth. *Anatomy*, we are told, was ſo very much cultivated by the Kings of *Egypt*, that they particularly ordered the Bodies of dead Men to be opened, that ſo Phyſick might be equally perfect in all its parts. Where ſuch Care has been uſed, proportionable Progreſſes may be expected, and the World has a Right to make a Judgment not only according to what is now to be found, but according to what might have been found, if theſe Accounts had been really true. In

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In the firſt Place therefore, we may obſerve, That *the Civil Hiſtory of* Egypt is as lamely and as fabulouſly recorded as of any Nation in the Univerſe: And yet, the *Egyptians* took more than ordinary Care to pay all poſſible Honours to the Dead, eſpecially their Kings; by preſerving their Bodies with Bitumen and reſinous Drugs, and by building ſumptuous Monuments to lay them in: This certainly was done to perpetuate their Memories, as well as to pay them Reſpect: It was at leaſt as Ancient as *Joſeph*'s Time; how much older we know not. The *Jews*, who for another and a more ſacred Reaſon, took care of their Dead, took equal Care to preſerve their Genealogies, and to draw an Uniform Thread of their Hiſtory from *Abraham* down to the Deſtruction of the Second Temple. Herein they acted conſiſtently, and their Hiſtory is a ſtanding Inſtance of this their Care; whereas the *Egyptian* Hiſtory is ſo very inconſiſtent a Buſineſs, that it is impoſſible to make a coherent Story out of it: Not for Want of Materials, but becauſe their Materials neither agree with themſelves, nor with the Hiſtory of any other Nation in the World.

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A more certain Proof of the Deficiency of the *Egyptian* Hiſtory cannot be produced, than that the *Time of the building of the Pyramids* was loſt when *Herodotus*; was in *Egypt*; as alſo the *Æra* of the only great Conquerour of that Nation, *Seſoſtris*. The firſt of theſe is not ſlightly to be paſſed over. Such vaſt Fabricks could not be raiſed without Numbers of Hands, and a great Expence of Time and Money, or ſomething equivalent. *The Traditions* of their Erection are indeed minutely enough ſet down in *Herodotus*; but then they are ſet down as *Traditions*; and which is more, they are ſolely to be found in him, though he is not the only ancient Writer that mentions the Pyramids; he only names *Cheops* and *Mycerinus*, who are differently named by other Hiſtorians; and the Time when they lived, is as little agreed upon, as the Names by which they are called. The Hiſtory of a Nation can ſure be worth very little, that could not preſerve the Memory of the Names at leaſt, if not the Time, of thoſe Princes, who were at ſo much Pains to be remembred, in a Place where their Monuments were ſo very viſible, that no Perſon could ever ſail up and down the *Nile*, to or from their capital City *Memphis*, without taking Notice of them; and every Man

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Man upon his first seeing of them would naturally ask, what they were, by whom, and for what Intent erected. To which we may add, that these very Buildings are more exactly described in Mr. *Greaves's Pyramidographia*, than in any ancient Author now extant.

The Difficulty of determining the Age when *Sesostris* lived, is another Instance of the Carelesness of the *Egyptian* Historians. Either he was the same with *Shesbak*, who invaded *Judæa* in *Rehoboam's* Time, as Sir *John Marsham* (*f*) asserts after *Josephus*, or not: If he was, his Time is known indeed, but then the Authority of *Manetho*, and of those Pillars from which *Manetho* pretended to transcribe the Tables of the several Dynasties of the *Egyptian* Kings, is at an End; besides, it contradicts all the *Greek* Writers that mention *Sesostris*, who place him in their fabulous Age, and generally affirm, that he lived before the Expedition of the *Argonauts*, which preceded the War of *Troy*. If he was not that *Sheshak*, then the Time when the only famous Conqueror of the *Egyptian* Nation lived is uncertain, and all that they know of him is, that *once upon a time* there was a mighty King in Egypt, who conquered *Ethiopia*, *Arabia*, *Assyria* and up to *Colchis*,

(f) In Canone Chronico.

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chis, with *Asia* the Less, and the Islands of the *Ægean* Sea, where having left Marks of his Power, he returned home again to reap the Fruits of his Labours: A Tradition which might have been preserved without setting up a College at *Heliopolis* for that Purpose.

The very learned Mr. *Dodwell* in his Discourse *concerning the* Phœnician *History of* Sanchoniathon, advances a Notion which may help to give a very probable Account of those vast Antiquities of the *Egyptians* pretended to by *Manetho*. He thinks that after the History of *Moses* was translated into *Greek*, and so made common to the learned Men of the neighbouring Nations, that they endeavoured to rival them by pretended Antiquities of their own, that so they might not seem to come behind a People, who till then had been so obscure. This, though particularly applied by Mr. *Dodwell* to *Sanchoniathon*'s History, seems equally forcible in the present Controversie: For *Manetho* dedicated his History to *Ptolemee Philadelphus*, at whose Command it was written, and wrote it about the Time that the LXXII Interpreters translated the *Pentateuch*. The great Intercourse which the *Egyptians* and *Israelites* formerly had each with other, made up a considerable part

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part of that Book, and occaſioned its being the more taken Notice of; ſo that this Hiſtory being injurious to the vain pretences of that People, might very probably provoke ſome that were jealous for the Honour of their Nation, and *Manetho* amongſt the reſt, to ſet up an Anti-Hiſtory to that of *Moſes*; and to dedicate it to the ſame Prince who employed the *Jews* to tranſlate the *Pentateuch*, and who ordered *Manetho* himſelf to bring him in an Account of the *Egyptian* Antiquities, that ſo any Prejudices which *Ptolemee*, who was of another Nation himſelf, might entertain againſt their Country, might be effectually removed.

This Notion is the more probable in our Caſe, becauſe it equally holds, whether we follow Sir *John Marſham*'s Accounts, who has made the *Egyptian* Antiquities intelligible; or whether they are left in the ſame Confuſion that they were in before. That moſt Learned Gentleman has reduced the wild Heap of *Egyptian* Dynaſties into as narrow a Compaſs as the Hiſtory of *Moſes*, according to the *Hebrew* Account, by the help of a Table of the *Theban* Kings, which he found under *Eratoſthenes*'s Name, in the Chronography of *Syncellus*. For, by that Table he 1. Diſtinguiſhed the Fabulous and Myſtical

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Myſtical Part of the *Egyptian* Hiſtory, from that which ſeems to look like Matter of Fact. 2. He reduced the Dynaſties into Collateral Families, reigning at the ſame time, in ſeveral Parts of the Country; which, as ſome learned Men ſaw before, was the only Way to make thoſe Antiquities conſiſtent with themſelves, which till then were confuſed and incoherent. But it ſeems evident by the Remains that we have of *Manetho* in *Euſebius*, and by the Accounts which we have of the *Egyptian* Hiſtory in *Joſephus*'s Books againſt *Appion*, and in the Ancient *Chriſtian* Writers, that the *Egyptians* in *Ptolemee*'s Time did not intend to confine themſelves within the Limits ſet by *Moſes*, but reſolved to go many Thouſand Years beyond them. If therefore *Eratoſthenes*'s Table be genuine, not only *Manetho*'s Authority ſinks, but the Pillars from whence he tranſcribed his Tables of the Kings of their ſeveral Dynaſties are Impoſtures, ſince they pretend to give ſucceſſive Tables of vaſt Numbers of Kings reigning in ſeveral Families, for many Ages; which ought to be contracted into a Period of Time, not much exceeding Two Thouſand Years. If the Table of *Eratoſthenes* be not the true Rule by which the *Egyptian* Antiquities are to be ſquared,

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ſquared, then the former Prejudices will return in full force; and one cannot value *Tables*, and *Pillars*, and *Prieſts*, that could not fix *the Time of the Erection of the Pyramids*, and *the Age of* Seſoſtris, ſo certainly, as that when *Herodotus* was in the Country, they might have been able to inform him a little better than they did.

This long Enquiry into the *Egyptian* Hiſtory will not, I hope, be thought altogether a Digreſſion from my Subject, becauſe it weakens the *Egyptians* Credit in a very ſenſible Part: For, if their Civil Hiſtory is proved to be egregiouſly fabulous, or inconſiſtent, there will be no great Reaſon to value their mighty Boaſts in any thing elſe; at leaſt, not to believe them upon their own Words, without other Evidence.

In Mathematicks, the *Egyptians* are, of all Hands, allowed to have laid the firſt Foundations: The Queſtion therefore is, how far they went. Before this can be anſwered ſatisfactorily, one ought to enquire whether *Pythagoras* and *Thales*, who went ſo far to get Knowledge, would not have learnt all that the *Egyptians* could teach them: Or whether the *Egyptians* would willingly impart all they knew. The former, I ſuppoſe, no Body queſtions:

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queſtions: For the latter, we are to diſtinguiſh between Things that are concealed out of Intereſt, and between other things, which, for the ſame Intereſt, are uſually made publick. *The Secrets of the* Egyptian *Theology* were not proper to be diſcovered, becauſe by thoſe Myſteries they kept the People in awe: *The Philoſopher's Stone* likewiſe, if they had been Maſters of it, might, for Gain, have been concealed: And *Medicinal Arcana* are of Advantage oftentimes to the Poſſeſſors, chiefly becauſe they are *Arcana*. But *Abſtracted Mathematical Theories*, which bring Glory to the Inventors when they are communicated to thoſe that can reliſh them, and which bring no Profit when they are locked up, are never concealed from ſuch as ſhew a Deſire to learn them; provided that by ſuch a Diſcovery the firſt Inventors are not deprived of the Glory of their Inventions; which is increaſed by publiſhing, if they have before-hand taken Care to ſecure their Right. So that we may reaſonably conclude, that when *Pythagoras* is commended for no famous Invention in Geometry, except the 47th. Propoſition of the Firſt Book of *Euclid*, that he brought nothing of more Moment, in that Way, with him, out of *Egypt*; and therefore, either the further

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Discoveries that were made in Geometry, were made by the *Egyptians* afterwards; or, which is more probable, they were *Grecian* Superstructures upon those Foundations. Besides, though a Man travelled into *Egypt*, yet it does not follow from thence that he learnt all his Knowledge there. So that though *Archimedes* and *Euclid* were in *Egypt*, yet they might, for all that, have been Inventors themselves of those noble Theorems which are in their Writings. In *Archimedes*'s Time *Greeks* lived in *Alexandria*; and the Learning of *Egypt* could no more at that time be attributed to the old *Egyptians*, than the Learning of Archbishop *Usher*, Sir *James Ware*, and Mr. *Dodwell*, can be attributed to a Succession of those learned *Irish*-men who were so considerable in the *Saxon* Times.

This last Consideration is of very great Moment; for few of the *Greeks*, after *Plato*, went into *Egypt* purely for Knowledge: and though *Plato* brought several of his Notions out of *Egypt*, which he interwove into his Philosophy, yet the Philosophers of the *Alexandrian* School, who, for the most part, were *Platonists*, shew by their Way of Writing, and by their frequent Citations out of *Plato*'s Books, that they chose to take those Things

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Things from the *Grecians*, which one would think might have been had nearer home, if they had been of the Original Growth of the Country. The moſt conſiderable Propoſitions in *Euclid*'s Elements were attributed to the *Greeks*; and we have nothing confeſſedly *Egyptian*, to oppoſe to the Writings of *Archimedes*, *Apollonius Pergæus*, or *Diophantus*: Whereas, had there been any Thing conſiderable, it would moſt certainly have been produced, or, at leaſt, hinted at, by ſome of thoſe very learned *Egyptians*, or rather later *Greeks* born in *Egypt*; whoſe Writings that treat of the Extent of the *Egyptian* Knowledge, are ſtill extant.

Having now examined the *Hiſtory* and *Geometry* of the *Egyptians*, it will be much eaſier to go through their Pretences, or rather the Pretences of their Advocates, to Superiority in other Parts of Learning. The *Egyptians* ſeem to have verified the Proverb, *That he that has but one Eye, is a Prince among thoſe that have none.* This was Glory enough; for it is always very honourable to be the Firſt, where the Strife is concerning Things which are worth contending for.

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CHAP. X.

Of the Natural Philoſophy, Medicine and Alchemy of the Ancient Egyptians.

THE *Egyptian Natural Philoſophy* and *Phyſick* ſhall be joined together, becauſe there is ſo great an Affinity between them, that true Notions in either Science aſſiſt the other. Their *Phyſick*, indeed, was very famous in *Homer*'s Time: And wonderful Things are told of *Hermes*, the pretended Father of the Chymical Art. But one ought to diſtinguiſh between particular Medicines, how noble ſoever, and general Theories founded upon a due Examination of the Nature of thoſe Bodies from whence ſuch Medicines are drawn, and of the Conſtitution and Fabrick of the Bodies of the Patients to whom they are to be applied, and of the incidental Circumſtances of Time and Place; which are neceſſary to be taken in by a wiſe Phyſician. The Stories of the *Weſt-Indian* Medicines are many of them very aſtoniſhing; and thoſe Salvages knew perfectly how to uſe them, and yet they were never eſteemed able Phy-

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Phyſicians. This Inſtance is applicable to the preſent Queſtion: *Galen* often mentions *Egyptian* Remedies in his Treatiſes *of Medicines*, which are numerous and large, yet he ſeldom mentions any of their Hypotheſes, from which only a Man can judge whether the *Egyptians* were well-grounded Phyſicians, or Empiricks. This is the more remarkable, becauſe *Galen* had lived long at *Alexandria*, and commends the Induſtry of the *Alexandrians* in cultivating Anatomy, which is ſo neceſſary a Part of a Phyſician's Buſineſs.

In general therefore we may find, that all the *Egyptian Notions of Phyſical Matters* were built *upon Aſtrological and Magical Grounds*: Either the Influence of a particular Planet, or of ſome tutelar Dæmon were ſtill conſidered. Theſe Foundations are precarious and impious, and they put a Stop to any Increaſe of real Knowledge, which might be made upon other Principles. He that minds the Poſition of the Stars, or invokes the Aid of a Dæmon will rarely be ſollicitous to examine nicely into the Nature of his Remedies, or the Conſtitution of his Patients, without which none of the ancient rational Phyſicians believed that any Man could arrive at a perfect Knowledge of their

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Art. So that if *Hippocrates* learn'd his Skill in *Egypt*, as it is pretended, the *Egyptian* Physicians afterwards took a very stupid Method to run upon imaginary Scents, so far as even to lose the Memory that they had ever pursued more rational Methods. Those that would be further satisfied of the Truth of this Matter of Fact, may find it abundantly proved in *Conringius*'s Discourse *of the old Egyptian Medicine* (*h*).

(h) *De Hermeticâ Ægyptiorum vetere & Paracelsicorum novâ Medicinâ.*

But we are told, that there was *a particular sort of Physick*, used only *amongst the* Egyptian *Priests*, which was kept secret, not only from the *Greeks* that came into their Country for Knowledge, but from the Generality of the Natives themselves; wherein, by the Help of the *Grand Elixir*, they could do almost any thing but restore Life to the Dead. This *Elixir*, which was a Medicine made with the Philosophers Stone, was a Chymical Preparation: And if we may believe *Olaus Borrichius* (*i*), the Great and Learned *Advocate* of the *Chymical* and *Adept Philosophers*, was the Invention of *Hermes*, who was contemporary with *Isis* and *Osiris*, whose Age none ever yet determined. If these Claims are true, there is no Question but the

(i) *De Ortu & Progressu Chemiæ*; as also *Hermetis Ægyptiorum & Chemicorum sapientia ab Herm. Conringii Animadversionibus vindicata.*

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the *Egyptians* underſtood Nature, at leaſt that of Metals, in a very high Degree. This is *an Application of Agents to Patients* (*k*), which, if made good, will go farther than any Aſſertion commonly brought to prove the extent of *Egyptian* Knowledge: And therefore, I preſume, I ſhall not be thought tedious if I enlarge more particularly upon this Queſtion, than I have done upon the reſt; eſpecially ſince there has not been, that I know of, any direct Anſwer ever Printed to *Borrichius*'s Book upon this Argument, which he wrote againſt the forementioned Diſcourſe of *Conringius*.

(*k*) Pag. 46.

One may juſtly wonder that there ſhould have been ſo noble an Art as that of turning baſer Metals into Gold and Silver ſo long in the World, and yet that there ſhould be ſo very little, if any thing, ſaid of it in the Writings of the Ancients. To remove this Prejudice therefore, all the fabulous Stories of the *Greeks* have, by Men of fertile Inventions, been given out to be diſguiſed Chymical *Arcana*. *Jaſon*'s *Golden Fleece*, which he brought from *Colchis* was only a *Receipt to make the Philoſopher's Stone*, and *Medea* reſtored her Father-in-Law, *Æſon*, to his Youth again by the Grand *Elixir*. *Borrichius* is very confident that the *Egyptian* Kings

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built the Pyramids with the Treaſures that their Furnaces afforded them, ſince if there were ſo many Thouſand Talents expended in Leeks and Onions, as *Herodotus* tells us there were, which muſt needs have been an inconſiderable Sum in Compariſon of the whole Expence of the Work, one cannot imagine how they could have raiſed Money enough to defray the Charge of the Work any other Way. And ſince *Borrichius*, *Jacobus Tollius* has ſet out a Book called *Fortuita*, wherein he makes moſt of the Old Mythology to be Chymical Secrets.

But though *Borrichius* may believe that he can find ſome obſcure Hints of this *Great Work* in the Heathen Mythologiſts, and in ſome ſcattered Verſes of the Ancient Poets, which according to him they themſelves did not fully underſtand when they wrote them; yet this is certain, That the ancienteſt Chymical Writers now extant, cannot be proved to have been ſo old as the Age of *Auguſtus*. *Conringius* believes that *Zoſimus Panopolita* is the oldeſt Chymical Author that we have, whom he ſets lower than *Conſtantine the Great*. That perhaps may be a Miſtake; for *Borrichius*, who had read them both in *MS.* in the *French* King's Library, brings very plauſible Arguments to prove that

that *Olympiodorus*, who wrote Commentaries upon ſome of the Chymical Diſcourſes of *Zoſimus*, was 150 Years older than *Conſtantine*, becauſe he mentions the *Alexandrian* Library in the Temple of *Serapis*, as actually in being, which in *Ammianus Marcellinus*'s Time, who was contemporary with *Julian* the Apoſtate, was only talked of, as a thing deſtroyed long before. I don't mean that which was burnt in *Julius Cæſar*'s Time, but one afterwards erected out of the ſcattered Remains that were ſaved from that great Conflagration, which is mentioned by *Tertullian*, under the Name of *Ptolemee*'s Library at *Alexandria*. If this *Zoſimus* is the ſame whom *Galen* mentions, for a Remedy for ſore Eyes, in his 4th. Book *of Topical Medicines*, then both he and *Olympiodorus* might have been conſiderably older; and yet have lived ſince our Bleſſed Saviour's Time. However, be their Age what it will, they wrote to themſelves, and their Art was as little known afterwards as it was before; *Julius Firmicus* is the Firſt Author that has mentioned *Alchemy*, either by Name, or by an undiſputed Circumlocution; and he dedicated his Book *of Aſtrology* to *Conſtantine the Great*. *Manilius* indeed (who is ſuppoſed to have lived in *Auguſtus*'s Time) in

in the 4th. Book of his *Astronomicon*, where he gives an Account of those that are born under *Capricorn*, has these Words,

——— ſcrutari cæca metalla,
Depoſitas & opes, terræq; exuere venas,
Materiemq; manu certâ duplicarier arte:

which laſt Verſe ſeems to be a Deſcription of *Alchemy*: But beſides that, the Verſe is ſuſpected to be ſpurious; even the Age of *Manilius* himſelf is not without Controverſie; ſome making him contemporary with the Younger *Theodoſius*, and conſequently later than *Firmicus* himſelf. We may expect to have this Queſtion determined, when my moſt Learned Friend Mr. *Bentley* ſhall oblige the World with his *Cenſures* and *Emendations* of that Elegant Poet.

But if theſe *Grecian* Chymiſts have the utmoſt Antiquity allowed them that *Borrichius* deſires, it will ſignifie little to deduce their Art from *Hermes*, ſince Men might pretend that their Art was derived from him in *Zoſimus*'s Days, and yet come many Thouſand Years ſhort of it, if we follow the Accounts of *Manetho*. Wherefore, though this is but a negative Argument, yet it ſeems to be unanſwerable, becauſe if there had been ſuch an Art, ſome

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ſome of the *Greeks* and *Romans*, who were ſucceſſively Maſters of *Egypt*, would have mentioned it at leaſt, before *Zoſimus*'s Time. Such a Notice whether with Approbation, or Contempt, had been ſufficient to aſcertain the Reality of ſuch a Tradition. *Tacitus* (l) tells us that *Nero* ſent into *Africa* to find ſome Gold, that was pretended to be hid under Ground: This would have been an excellent Opportunity for him to have examined into this Tradition, or to have puniſhed thoſe, who either falſly pretended to an Art which they had not, or would not diſcover the true Secret; which in his Opinion would have been equally criminal; and had *Nero* done it, *Pliny* would have told us of it, who was very inquiſitive to collect all the Stories he could find of every thing that he treats about, whereof Gold (m) is one that is not ſlightly paſſed over; and beſides, he never omits a Story becauſe it appears ſtrange, and incredible, if we may judge of what he has left out, by what he has put in, but often ranges the wonderful Qualities of natural Bodies under diſtinct Heads, that they might be the more obſerved.

(l) Annal. Lib. XVI.

(m) Nat. Hiſt. Lib. XXXIII. cap. 1, 2, 3, 4.

To evade the Force of this Argument, *Borrichius* (n) ſays that the *Egyptians* were afraid of their Conquerours, and ſo induſtriouſly

(n) Herm. Ægypt.

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induſtriouſly concealed their Art. But there is a wide Difference between concealing the Rules and Precepts of an Art, and concealing the Memory that ever there was ſuch an Art. If it was ever known before the *Perſian* Conqueſt, as by his Account of the Erection of the Pyramids, which were built many Ages before *Cambyſes*'s Time, it is plain he believes it was, though we ſhould allow it to have been in few Hands, it is not credible that this Art of making Gold ſhould never have been pretended to before *Diocleſian*'s Time, who is reported by *Suidas* to have burnt great Numbers of Chymical Book, which gave an Account of the Proceſs. Whereas afterwards, ever now and then, Footſteps of cheating *Alchemiſts* are to be met with in the *Greek* Hiſtorians. It was not poſſible to pretend to greater Secrecy in the Manner of their Operations, than is now to be found in all the Writings of Modern Adept Philoſophers (as they call themſelves.) And yet theſe Men, who will not reveal their Proceſs, would think themſelves affronted, if any Man ſhould queſtion the real Exiſtence of their Art.

But the Hypotheſis of thoſe who find Chymical Secrets in *Homer*, *Virgil*, and the reſt of the ancient Poets, is liable to ſeveral

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ſeveral Exceptions taken Notice of neither by *Conringius* nor *Borrichius.*

1. They ſay that when *Jaſon* heard that the King of *Colchis* had a Book writ upon a Ram's-skin, wherein was the Proceſs of the Philoſopher's Stone, he went with the *Argonauts* to fetch it. Here it may be objected, 1. That it is not likely that *Seſoſtris*, who conquered *Colchis*, would ever ſuffer the *Egyptian* Prieſts to reveal ſuch a Secret to that conquered People. *Diocleſian* according to them burnt all the Chymical Books that he could find in *Egypt*, that the *Egyptians* might not rebel, when they were deprived of that Fund, which ſupported their Wars. And *Borrichius* ſuppoſes that the *Egyptian* Prieſts uſed this Art chiefly to ſupply the Expences of their Kings. 2. How came *Jaſon* and the *Argonauts* not to grow richer by this Fleece? It cannot be pretended that it was concealed from them, becauſe it was like the Books of the Modern *Adepti*, written in ſo obſcure a Stile, that it was unintelligible for want of a Maſter; ſince *Medea* was with *Jaſon*, who had the Secret, what or how great ſoever it was. 3. Since the *Grecians* were not tied to Secrecy, how came their Traditions to be ſo obſcure, that thoſe Paſſages in *Apollonius Rhodius*'s *Argonauticks* which

which are supposed to be meant of the *Grand Elixir*, were never applied to a Chymical Sense, till the Writings of *Synesius*, *Zosimus*, and the other old *Grecian* Chymists appeared? Especially since, 4. *Apollonius Rhodius* himself was an *Alexandrian Greek*, born in *Egypt*, and so could easily acquaint himself with the Traditions of that Country, which he, originally of another Nation, was under no Obligation to conceal.

2. The Chymists, at least *Borrichius* for them, own *Democritus*'s Books to be genuine, upon the Credit of *Zosimus* who quotes them: If they are, this pretended Secrecy falls to the Ground: For *Democritus* affirms, That he learnt his Art from *Ostanes* a *Mede*, who was sent by the Kings of *Persia* into *Egypt*, as Governour of the *Egyptian* Priests. Then the Secret was divulged to some of the Conquerours of their Country. If so, why no more Tradition of it? If not the Process it self, yet at least the Memory that once there was such a Process? Which would have been enough for this Purpose. The same Question may be asked of *Democritus*, to whom *Ostanes* revealed it. This will weaken *Zosimus*'s Credit as an Antiquary, upon whose Assertion most of this pretended Antiquity

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is founded. Since at the ſame Time that he objects the Secrecy of the ancient *Egyptian* Prieſts, as a Reaſon why the Memory of this Art was ſo little known, he owns himſelf obliged to a *Greek*, who had it from the *Egyptians* at Second Hand.

But how will theſe Pretenders to remote Antiquity, who tell us, that *Moſes*, by his Skill in Chymiſtry, ground the Golden Calf to Powder, reconcile a Paſſage in *Theophraſtus* to their Pretenſions? He, ſpeaking of Quickſilver *(o)*, ſays that the Art of extracting it from *Cinnabar* was not known till 90 Years before his Time, when it was firſt found out by *Callias* an *Athenian*. Can we think that the *Egyptians* could hinder theſe inquiſitive *Grecians*, who ſtaid ſo long in their Country, from knowing that there was ſuch a Metal as *Mercury*? Or could theſe *Egyptians* make Gold without it? If they could, they might reaſonably ſuppoſe that the *Iſraelites* could make Brick without Straw, ſince they could make Gold and Silver without that, which Modern *Adepti* affirm to be the Seed of all Metals. *Theophraſtus*'s Words are too general, to admit of an Objection, as if he believed that *Callias*'s Invention ought to be limited to his own Country. This, join'd to

(o) Lib. de Lapidibus.

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to the great Silence of the Ancients, especially *Herodotus* and *Diodorus Siculus*, who dwell so long upon the *Egyptian* Arts and Learning, concerning most of the wonderful *Phænomena* of that extravagant Metal, plainly shews that there were no Traditions of such mighty things to be done by it, as the *Alchemist*'s Books are full of. *Borrichius* therefore recurrs to his old Subterfuge, *Egyptian* Secrecy, and finds some doubtful at least, if not fabulous, Stories of *Dædalus*, and *Icarus*, and the Poetical Age, which he opposes to the positive Testimony of *Theophrastus*. Perhaps this may be thought to be begging the Question, since some who have written of the Philosophers Stone, have taught that their *Mercury* has no Affinity with common *Mercury*: Which has led many Persons to try several extravagant Processes to find it out. But *Eirenæus Philalethes*, who is look'd upon as one of the cleerest Writers that has ever written upon this Subject; says expressly that *(p) Natural* Mercury *Philosophically prepared is the Philosophical Menstruum, and the dissolvent* Mercury.

(p) *Enarratio Methodica trium Gebri Medicinarum, p.* 18.

After so long an Enquiry into the Antiquity of this Art of transmuting Metals, it will be asked perhaps, what may be thought of the Art it self. I must needs say

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ſay, I cannot tell what Judgment to make of it: The Pretences to Inſpiration, and that Enthuſiaſtick Cant, which run through the Writings of almoſt all the *Alchemiſts*, ſeem ſo like Impoſture, that one would be tempted to think that it was only a Deſign carried on from Age to Age, to delude Mankind: and it is not eaſy to imagine why God ſhould hear the Prayers of thoſe that deſire to be rich. If, as they pretend, it was Zeal for the good of Mankind that made them take ſuch Pains to find out ſuch noble Medicines as ſhould free Men from the moſt obſtinate Diſeaſes to which our Natures are ſubject, why do they not communicate them, and leave the Proceſs in Writing plainly to Poſterity, if they are afraid of Danger for themſelves: Concern for the Welfare of Mankind and affected Secrecy, ſeem here inconſiſtent things: Men of ſuch mortified Tempers, and publick Spirits ought not to be concerned, though Gold or Silver were made as common as Lead, or Tin, provided that the Elixir which ſhould remove all Diſeaſes were once known.

Though theſe are reaſonable Prejudices againſt the Belief of the Truth of this Operation, yet one can hardly tell how to contradict a Tradition ſo general,

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and so very well attested (q). So many Men, methinks, could not have cheated the World successfully so long, if some had not been sincere: And, to use a Proverb in their own Way, *so much Smoak could scarce have lasted so long without some Fire.* Till the seminal Principles from which Metals are compounded, are perfectly known, the Possibility of the Operation cannot be disproved: Which Principles, as all other real Essences of things, are concealed from us. But as a wise Man cannot, perhaps, without Rashness disbelieve what is so confidently asserted, so he ought not to spend much Time and Cost, about trying whether it will succeed, till some of the *Adepti* shall be so kind as to give him the Receipt.

(q) *Vide Borrichium de Ortu & Progressu Chemiæ, & Morhofii Epistolam de transmutatione Metallorum ad Joelem Langelottum.*

By what has been said it is evident, what Opinion one ought to have of the Chymical Skill of the ancient *Egyptians:* Though it is most probable that the Art owes its Original to them, from whom it receives its Name: But this Original is much too late to do Sir *William Temple*'s Hypothesis any Service.

But it is high Time to leave the *Egyptian Physick*, and therefore, I shall only add One or Two Instances of their *Skill*

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in Anatomy, and ſo paſs on. *Gellius (r)* and *Macrobius (ſ)* obſerve; the one from *Appion*, who wrote of the *Egyptians*; the other from the *Egyptian* Prieſts themſelves, that there is a particular *Nerve* that goes from the Heart to the little Finger of the Left-Hand, for which Reaſon they always wore Rings upon that Finger; and the Prieſts dipped that Finger in their perfumed Ointments; this being ridiculed by *Conringius*, *Borrichius (t)* aſſures us that he always found ſomething to countenance this Obſervation upon cutting of his Nails to the quick: *Pliny* in the *37th.* Chapter of the *11th.* Book of his *Natural Hiſtory*, and *Cenſorinus* in the *17th.* Chapter of his little Book *De Die Natali*, give this following Reaſon from *Dioſcorides* the Aſtrologer, why a Man cannot live above a Hundred Years, becauſe the *Alexandrian* Embalmers obſerved a conſtant Increaſe and Diminution of Weight of the Hearts of thoſe ſound Perſons whom they opened, whereby they judged of their Age. They found that the Hearts of Infants of a Year old weighed two Drachms, and this Weight encreaſed Annually by two Drachms every Year till Men came to the Age of Fifty Years: At which Time they as gradually decreaſed till they came to an Hundred,

(r) Noct. Attic. Lib. X. cap. 10.

(ſ) Saturnal. l. 7. cap. 13.

(t) Herm. Ægypt. Præfat.

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when, for want of a Heart, they must necessarily die.

To these two Instances of the *Criticalness* of *Egyptian Anatomy* I shall add one of *their Curiosities in Natural Enquiries*; and that is, *their Knowledge of the Cause of the Annual Overflowing of the* Nile. This, which was the constant Wonder of the Old World, was a *Phænomenon* seldom over-looked by the *Greek* Philosophers: Seven of whose Opinions are reckoned up by *Plutarch*, in the First Chapter of the Fourth Book *of his Opinions of the Philosophers*. If Curiosity generally attends a Desire of Knowledge, and grows along with it, then the *Egyptian* Priests were inexcusably negligent, that they did not know that the swelling of the *Nile* proceeded from the Rains that fell in *Ethiopia*, which raising the River at certain Seasons, made that overflowing of the Flats of *Egypt*. One would think that in *Sesostris*'s Time the *Egyptian* Priests had Access enough into *Ethiopia*; and whoever had once been in that Country could have resolved that Problem, without any Philosophy. It was known indeed in *Plato*'s Time, for then the Priests told it to *Eudoxus*; but *Thales*, *Democritus*, and *Herodotus*, who had all enquired of the *Egyptians*, give such uncouth

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couth Reaſons, as ſhew that they only ſpoke by gueſs. *Thales* thinks that the *Eteſian* Winds blew at that Time of the Year againſt the Mouths of the River, ſo that the freſh Water finding no Vent, was beaten back upon the Land. *Democritus* ſuppoſes that the Northern Snows being melted by the Summer Heats, are drawn up in Vapours into the Air, which Vapours circulating towards the South, are by the Coldneſs of the *Eteſian* Winds condenſed into Rain, by which the *Nile* is raiſed. *Herodotus* thinks that an equal Quantity of Water comes from the Fountains in Summer and Winter, only in Summer there are greater Quantities of Water drawn up by the Sun, and in Winter leſs, and ſo by Conſequence all that Time it overflowed. *Democritus*'s Opinion of the *Phænomenon* ſeems not amiſs, though his Hypotheſis of the Cauſe of it is wrong in all Probability: Yet it is plain, That *Plutarch* did not believe it to be the ſame with that which the *Egyptian* Prieſts gave to *Eudoxus*, which is the only true one, becauſe he ſets them both down apart. The Cauſe of this wonderful *Phænomenon* could not be pretended to be a Secret; no Honour could be got by concealing a thing, the pretended Ignorance whereof was rather a

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Disgrace. Those *Egyptian* Priests, whose Business it was to gather Knowledge, must have had an extraordinary Love for a sedentary Life, or have been averse to inform themselves from others, more than the rest of Mankind, who would not be at the Pains either to learn what *Sesostris*'s Soldiers could have told them, or to go about Two Hundred Miles Southward to search for that, which they must certainly have often *reasoned about*, if they were such Philosophers as they pretended to be.

Nay, by the Curiosity of the *Greeks* we are sure they did *reason about* it; they thought it as much a Wonder as we can do now: Rather more, because they knew of no other Rivers, that overflow at periodical Seasons like it, as some are now known to do in the *East-Indies*.

Upon the whole Matter, after a particular Search into the whole Extent of *Egyptian* Learning, there seems to be no Reason to give the *Egyptians* the Preeminence in point of Knowledge above all Mankind. However, considering the great Labour which is requisite to form the First Notions of any part of Learning, they deserve great Applause for what they discovered, and ought to have proportionable Grains of Allowance for

what

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what they left unfiniſhed: So that when the Holy Scriptures *(u)* aſſure us that *Moſes* was skilled in all the Learning of the *Egyptians*, they give him the greateſt Character for humane Knowledge that could then be given to any Man. The *Egyptian* Performances in Architecture were very wonderful, and the Character which *Hadrian* the Emperour gives them, that they found Employments for all Sorts of Perſons, the Blind, the Lame, the Gouty, as well as the ſtrong and healthy, ſhews that it was natural to the *Egyptians* to be always buſied about ſomething uſeful. The Art of Brewing Mault-drinks was very anciently aſcribed *(w)* to the *Egyptians* as the firſt Inventors, for which theſe Northern Nations are not a little beholding to them. Their Laws have, by thoſe who have taken the greateſt Pains *(x)* to deſtroy the Reputation of their Learning in other things, been acknowledged to be very wiſe, and worth going ſo far as *Pythagoras*, *Solon* and *Lycurgus* did to fetch them. So that if Sir *William Temple* had extolled their Learning with any other Deſign than that of diſparaging the Knowledge of the preſent Age, there would have been no Reaſon to oppoſe his Aſſertions.

(u) Acts VII. 22.

(w) Herodotus Columella, Lib. X.

(x) Conringius in Medicinâ Hermeticâ.

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CHAP. XI.

Of the Learning of the Ancient Chaldeans *and* Arabians.

THE *Chaldeans* and the *Arabs* are the People that lie next in Sir *William Temple*'s Road. We may pronounce with ſome Certainty, 1. That the *Chaldean* Aſtronomy could not be very valuable, ſince, as we know from *Vitruvius*, and others, they had not diſcovered that the Moon is an Opake Body. Whether their Aſtronomical Obſervations were older than their Monarchy, is uncertain: If they were not, then in *Alexander the Great*'s Time they could not challenge an Antiquity of above Five or Six Hundred Years. I mention *Alexander*, becauſe he is ſaid to have ſent vaſt Numbers of Obſervations from *Babylon*, to his Maſter *Ariſtotle*. The *Aſſyrian* Monarchy, of which the *Chaldean* might not improperly be called a Branch, pretends, indeed, to great Antiquity: Great Things are told of *Ninus* and *Semiramis*, who is more than once mentioned by Sir *William Temple*, in theſe *Eſſays*, for her Victories, and her Skill in Gardening;

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ing; but these Accounts are, very probably, fabulous, for the following Reasons.

Till the Time of *Tiglath-Pileser* and *Pul*, we hear no News of any *Assyrian* Monarchs in the *Jewish* History. In *Amraphel*'s Time, who was overthrown by *Abraham* and his Family, in the Vale of *Siddim*, the Kings of *Chaldea* seem to have been no other than those of *Canaan*, Captains of *Hords*, or Heads of *Clans*: And *Amraphel* was Tributary to *Chedorlaomer* King of *Elam*, whose Kingdom lay to the East of *Babylon*, beyond the River *Tigris*. *Chushan Rishathaim* King of *Mesopotamia*, who was overthrown some Ages after by *Othoniel*, the *Israelitish* Judge, does not seem to have been a mighty Prince: It may be said, indeed, that he was General to some *Assyrian* Monarch; but that is begging the Question, since there is nothing which can favour such an Assertion in the Book of *Judges*.

But when the *Assyrians* and *Babylonians* come once to be mentioned in the *Jewish* History, they occurr in almost every Page of the *Old Testament*. There are frequent Accounts of *Pul*, *Tiglath-Pileser*, *Shalmanezer*, *Sennacherib*, *Esar-haddon*, *Nebuchadnezzar*, *Evil-merodach*, *Belshazzar*; and who not? But these Kings lived within

within a narrow Compaſs of Time; the oldeſt of them but a few Ages before *Cyrus*. This would not ſuit with that prodigious Antiquity which they challenged to themſelves. The Truth is, *Herodotus*, who knew nothing of it, being ſilent, *Cteſias* draws up a new Scheme of Hiſtory, much more pompous; and from him, or rather, perhaps, from *Beroſus*, who was Contemporary with *Manetho*, and ſeems to have carried on the ſame Deſign for *Chaldea*, which *Manetho* undertook for *Egypt*, *Diodorus Siculus*, *Pompeius Trogus*, *Euſebius*, *Syncellus*, and all the Ancients that take notice of the *Aſſyrian* Hiſtory, have afterwards copied.

Cteſias knew he ſhould be ſtraitned to find Employment for ſo many Kings for Thirteen Hundred Years; and ſo he ſays, they did little memorable after *Semiramis*'s Time. Sir *William Temple* employs them in Gardening: As if it were probable that a great Empire could lie ſtill for above a Thouſand Years; or that no Popular Generals ſhould wreſt the Reins out of the Hands of ſuch drowzy Maſters in all that Time. No Hiſtory but this can give an Inſtance of a Family that laſted for above a Thouſand Years, without any Interruption: And of all its Kings, not one is ſaid to reign leſs than Nineteen, but

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but ſome Fifty five Years. The healthieſt Race that ever was heard of; of whom, in Thirteen Hundred Years, not one died an untimely Death. If any Thing can be ſhowed like this in any other Hiſtory, Sacred or Profane, it will be eaſie to believe whatſoever is aſſerted upon this Subject.

If therefore the *Chaldean* Learning was no older than their Monarchy, it was of no great Standing, if compared with the *Egyptian*. The Account of *Nebuchadnezzar*'s Dream, in the 2d. Chapter of *Daniel*, ſhews the *Chaldean* Magick to have been downright Knavery; ſince *Nebuchadnezzar* might reaſonably expect that thoſe ſhould tell him what his Dream was, who pretended to interpret it when it was told them; both equally requiring a ſuper-natural Aſſiſtance: Yet there lay their chiefeſt Strength; or, at leaſt, they ſaid ſo: Their other Learning is all loſt. However, one can hardly believe that it was ever very great, that conſiders how little there remains of real Value, that was learnt from the *Chaldeans*. The Hiſtory of Learning is not ſo lamely conveyed to us, but ſo much would, in all probability, have eſcaped the general Ship-wrack, as that, by what was ſaved, we might have been able to gueſs at what was loſt.

If

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If the *Learning* of these *Ancient Chaldeans* came as near *that of the Arabs* as their Countries did, one may give a very good Judgment of its Extent. Sir *William Temple* observes, that Countries little exposed to Invasions, preserve Knowledge better than others that are perpetually harrassed by a Foreign Enemy; and by Consequence, whatsoever Learning the *Arabs* had, they kept; unless we should suppose that they lost it through Carelessness. We never read of any Conquests that pierced into the Heart of *Arabia the Happy*, *Mahomet*'s Country, before the Beginning of the *Saracen* Empire. It is very strange therefore, if, in its Passage through this noble Country, inhabited by a sprightly, ingenious People, Learning, like Quick-Silver, should run through, and leave so few of its Influences behind it. It is certain that the *Arabs* were not a learned People when they over-spread *Asia*: So that when afterwards they translated the *Grecian* Learning into their own Language, they had very little of their own, which was not taken from those Fountains. Their *Astronomy* and *Astrology* was taken from *Ptolemee*, their *Philosophy* from *Aristotle*, their *Medicks* from *Galen*; and so on. *Aristotle* and *Euclid* were first translated into

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into *Latin*, from *Arabick* Copies; and thoſe Barbarous Tranſlations were the only Elements upon which the *Weſtern School-men* and *Mathematicians* built. If they learnt any thing conſiderable elſewhere, it might be *Chymiſtry* and *Alchemy* from the *Egyptians*; unleſs we ſhould ſay that they tranſlated *Syneſius*, or *Zoſimus*, or ſome other *Grecian Chymiſts*.

Hence it follows, that the *Arabs* borrowed the greateſt part, at leaſt, of their Knowledge from the *Greeks*, though they had much greater Advantages of Communicating with the more Eaſtern Parts of the World, than either *Greeks* or *Romans* ever had. They could have acquainted us with all that was rare and valuable amongſt thoſe Ancient Sages. The *Saracen* Empire was under one Head in *Almanzor*'s Time; and was almoſt as far extended Eaſtward as ever afterwards. His Subjects had a free Paſſage, from the *Tagus* to the *Ganges*; and being united by the common Bond of the ſame Religion, the *Brachmans*, ſome of whom did, in all probability, embrace the *Mahometan* Faith, would not be ſhy of revealing what they knew, to their *Arabian* Maſters. By this Means, the Learning of the *Egyptians*, *Chaldeans*, *Indians*, *Greeks* and *Arabs*, ran in one common Channel. For

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ſeveral Ages, Learning was ſo much in Faſhion amongſt them, and they took ſuch Care to bring it all into their own Language, that ſome of the learnedeſt *Jews*, *Maimonides* in particular, wrote in *Arabick*, as much as in their own Tongue. So that we might reaſonably have expected to have found greater Treaſures in the Writings of theſe learned *Mahometans*, than ever were diſcovered before: And yet thoſe that have been converſant with their Books ſay, that there is little to be found amongſt them, which any Body might not have underſtood as well as they, if he had carefully ſtudied the Writings of their *Grecian* Maſters. There have been ſo many Thouſands of *Arabick* and *Perſick MSS.* brought over into *Europe*, that our learned Men can make as good, nay, perhaps, a better Judgment of the Extent of their Learning, than can be made, at this diſtance, of the *Greek*. There are vaſt Quantities of their Aſtronomical Obſervations in the *Bodleian* Library, and yet Mr. *Greaves* and Dr. *Edward Bernard*, two very able Judges, have given the World no Account of any Thing out of them, which thoſe *Arabian* Aſtronomers did not, or might not have learnt from *Ptolemee*'s *Almageſt*, if we ſet aſide their Obſervations which their *Grecian*

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cian Masters taught them to make; which, to give them their due, Dr. *Bernard* commends, as much more valuable than is commonly believed, in a Letter to Dr. *Huntingdon*, printed in the *Philosophical Transactions*, containing their Observations of the Latitudes of Twenty of the most eminent of the Fixed Stars. We owe, indeed, to them alone the Way of Counting by Ten Cyphers, ascending beyond Ten in a Decuple Proportion; which is of unspeakable Use in *Astronomical* and *Algebraical* Calculations, and, indeed, in all Parts of *Arithmetick*. The Use of *Chymistry* in *Physick*, together with some of the most considerable Chymical Preparations, which have led the Way to most of the late Discoveries that have been made in that Art, and in *Natural Philosophy* by its Means, have been unanimously ascribed to the *Arabs* by those Physicians that have studied their Books (*y*). Though, in Strictness, the whole *Arabian* Learning, with all their Inventions, what, and how great soever they were, may be reckoned as Modern, according to Sir *William Temple*'s Computation. But I am willing to give it up, and content my self with what has been done by the learned Men of these two last Ages, since the *Greeks* brought their Learning

(*y*) *Vide* Morhofii *Epist. ad* Langelottum.

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Learning along with them into *Italy*, upon the Taking of *Conſtantinople* by the *Turks*. At leaſt, this is evident, that the old *Arabian* Learning could never be any one of thoſe Fountains from whence the *Grecian* might have been drawn; and ſo can never be urged as ſuch by thoſe who give an Account of the Hiſtory of Learning.

CHAP. XII.

Of the Learning of the Chineſes.

BY this Time, I am afraid, I ſhall be thought as tedious as an *Iriſh Tale-teller*, fit for nothing but to lull my Reader aſleep: But there is but one Stage more left; and though it is a great Way off, yet it may be eaſily reached upon Paper, and then will be as eaſily diſpatched. For *China*, we are told, is a charming Country, and therefore moſt proper to be thought upon at the End of a tedious Diſcourſe.

Sir *William Temple* knows very well, That the whole *Chineſe* Hiſtory depends upon the ſole Authority of *Martinius*, and

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and thoſe Miſſionaries who publiſhed *Confucius* lately at *Paris*. *Martinius* (z) tells his Reader that he was obliged to learn Sixty Thouſand independent Characters before he could read the *Chineſe* Authors with Eaſe. This is, without all doubt, an excellent Method to propagate Learning, when Eight, or Ten of the beſt Years of a Man's Life muſt be ſpent in learning to read. The moſt conſiderable Specimen of *Chineſe* Learning that we have, is in the Writings of *Confucius*; which if F. *Couplet* and his Companions had Printed under their own Names, Sir *William Temple* would have been one of the firſt (a) that would have called *thoſe Rules and Inſtructions diſcourſed of with great Compaſs of Knowledge, Excellence of Senſe, Reach of Wit, illuſtrated with Elegance of Stile, and Aptneſs of Similitudes and Examples*, an incoherent Rhapſody of moral Sayings, which good Senſe and tolerable Experience might have furniſhed any Man with.

(z) Hiſt. Sinic. Præfat.

(a) page 178.

If the *Chineſes* think every part of Knowledge, but their own *Confucian* Ethicks, ignoble and mechanical, why are the *European* Miſſionaries ſo much reſpected for their Skill in Medicine and Mechanicks? So much Knowledge in Ma-

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thematicks as will but just serve an Almanack-maker, will do their Business. F. *Verbriſt* says in a Letter Printed some Years since in the *Philosophical Transactions*, That the Honours which were paid him in the Emperour's Court, were in a great Measure owing to his teaching the Emperour to find the Time of the Night by the fixed Stars and an Astrolable: This shews that the *Chineses* were very meanly skilled in these things; and it is probable, that those who are ignorant of such ordinary Matters, seldom carry their Speculations to a much greater Height.

Martinius and *Trigautius*, who lived long in *China*, were able fully to inform the World of the Extent of the *Chinese* Knowledge; and the Pains which *Martinius* has taken to write the History, and to state the Geography of that mighty Empire, is a sufficient Indication of his great Willingness to advance its Reputation in *Europe*. The *Chineses* are allowed to be a sagacious and industrious People, and their Skill in many mechanical Arts shew them to be so; so that if they had ever applied themselves to Learning in good earnest, and that for near so long a Time, as their History pretends to, there is no Question but we should have heard much more of their Progress.

And

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And therefore whatſoever can be ſaid of *Chineſe* Knowledge can never be of any Weight, as long as ſmall Skill in *Phyſick* and *Mathematicks* ſhall be enough to protect the *European* Miſſionaries in a Court where they themſelves are eſteemed the greateſt Scholars, and honoured accordingly.

But the *Chineſe Phyſick* is wonderfully commended by Dr. *Voſſius* and Sir *William Temple (b)*: *The Phyſicians excel in the Knowledge of the Pulſe, and of all ſimple Medicines, and go little further:* Neither need they; *for in the firſt, they are ſo skillful, that they pretend not only to tell by it, how many Hours or Days a ſick Man may laſt; but how many Years a Man in perfect ſeeming Health may live, in Caſe of no Accident or Violence; and by Simples they pretend to relieve all Diſeaſes that Nature will allow to be cured.* What this boaſted Skill is, may be ſeen in the little Tracts of the *Chineſe Phyſick* publiſhed by *Andrew Cleyer (c)*; but becauſe few will in all Probability have Patience to go through with them, ſince they are not very pleaſant to read, I ſhall give a ſhort Specimen of them, by which one may judge of the reſt.

(b) pag. 179, 180.

(c) Specimen Medicinæ Sinicæ. Francof. 1682. *Quarto.*

The moſt Ancient *Chineſe* Diſcourſe *of Phyſick*, Intituled, *Nuy Kim (d)*, gives

(d) Ibid. Pag. 85, 86, 87.

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this Account of the Production of our Bodies, and of the Relation of the several parts, with the Five Elements.

'Out of the Eastern Region arises the 'Wind, out of the Wind Wood, or Plants, 'out of Wood Acidity, from thence the 'Liver, from the Liver the Nerves, from 'them the Heart: The Liver is generated the Third in Order, and perfected 'the Eighth: The Spirits of the Liver, 'as they relate to the Heaven (the Air) 'are Wind; as Wood in the Earth, as 'the Nerves in our Bodies, so is the Liver in the Limbs: Its Colour is Blue, 'and its Use and Action is to move the 'Nerves: The Eyes are the Windows of 'the Liver; its Taste is acid, its Passion 'or Affection is Anger: Anger hurts the 'Liver, but Sorrow and Compassion conquer Anger, because Sorrow is the 'Passion of the Lungs, and the Lungs 'are Enemies to the Liver: Wind hurts 'the Nerves, but Drought, the Quality 'of the Lungs, conquers Wind: Acidity hurts the Nerves, but Acrimony, 'or that sharp Taste which is proper to 'the Lungs, conquers Acidity, or Metal conquers Wood.

'Out of the Southern Region arises 'Heat, out of Heat Fire, out of Fire 'Bitterness: From it the Heart is gene-

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'rated, thence the Blood; out of Blood 'comes the Spleen, or Earth out of Fire; 'the Heart governs the Tongue; that 'which is Heat in Heaven, Fire upon 'Earth, Pulsation in the Body, is the 'Heart in the Members: Its Colour is 'Red, has the Sound of Laughing; its 'Vicissitudes are Joy and Sorrow; the 'Tongue is its Window, its Taste Bitter-'ness, its Passion Joy; too much Joy hurts 'the Heart; but Fear, the Passion of the 'Reins, which are Enemies to the Heart, 'conquers Joy: Heat hurts the Spirits, 'but Cold conquers Heat: Bitterness 'hurts the Spirits, but Saltness of the 'Reins conquers Bitterness, or Water 'quenches Fire. The Heart is generated 'the Second in Order, and is perfected 'the Seventh.

'Out of the middle Region ariseth 'Moisture, out of that Earth; out of 'Earth Sweetness; from Sweetness com-'eth the Spleen, Flesh from that, and the 'Lungs from Flesh: The Spleen governs 'the Mouth; that which is Moisture in 'the Heaven, is Earth in Earth, Flesh in 'the Body, and the Spleen in the Mem-'bers: Its Colour is Yellow; it has the 'Sound of Singing; its Window is the 'Mouth, its Taste is sweet, its Passion is 'much Thoughtfulness: Thoughtfulness

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'hurts the Spleen, but Anger conquers 'Thoughtfulneſs: Moiſture hurts Fleſh, 'but Wind conquers Moiſture; Sweet-'neſs hurts Fleſh, but Acidity conquers 'Sweetneſs: In a Word, Wood conquers 'Earth, or the Liver the Spleen. The 'Spleen is generated the Fifth in Order, 'and is perfected the Tenth.

'Out of the Weſtern Region ariſes 'Drought: Thence come Metals, from 'them comes Sharpneſs, out of that are 'the Lungs, out of the Lungs come Skin 'and Hair, out of Skin and Hair come 'the Reins; the Lungs govern the No-'ſtrils: That which is Drought in the 'Heaven (or Air) is Metal in the Earth, 'Hair and Skin in the Body, and Lungs 'in the Members; Its Colour is Whitiſh, 'has the Sound of Weeping; its Win-'dows are the Noſtrils, its Taſt is ſharp, 'its Paſſion is Sorrow: Sorrow hurts the 'Lungs, but Joy conquers Sorrow: Heat 'hurts the Skin and Hair, but the Cold 'of the Reins conquers Heat: Sharp-'neſs hurts the Skin and Hair, but Bitter-'neſs conquers Sharpneſs. The Lungs 'are generated the Fourth in Order and 'are perfected the Ninth.

'Out of the Northern Region ariſes 'Cold, out of Cold comes Water, thence 'Saltneſs, thence the Reins, thence the 'Marrow

'Marrow of the Bones, thence the Liver. 'The Reins govern the Ears; that which 'is Cold in the Air, Water in the Earth, 'Bones in the Body, is Reins in the 'Members: Its Colour is Blackiſh, has 'the Sound of Sobbing; its Windows are 'the Ears, its Taſt is Saltneſs, its Paſſion is 'Fear: Fear hurts the Reins, but Thought-'fulneſs conquers Fear: Cold hurts the 'Blood, but Drought conquers Cold: Salt-'neſs hurts the Blood, but Sweetneſs con-'quers Saltneſs. The Reins are generated 'the Firſt in Order, and perfected the Sixth.

The Miſſionary who ſent this Account to *Cleyer* a Phyſician at *Batavia*, was afraid *(e)* that it would be thought ridiculous by *Europeans*; which Fear of his ſeems to have been well grounded. Another who lived long in *China*, wrote alſo an Account of the *Chineſe* Notions, of the Nature and Difference of Pulſes, which *(f)* he profeſſes that he would not undertake to prove by *European* Principles. One may judge of their Worth by the following Specimen *(g)*.

(e) *Riſum forte plus movebit Europæo, quam plauſum.* ibid. pag. 87.

(f) *Haud quaquam ſuſcipiam principia iſta principiis noſtratibus probanda.* ibid. pag. 2.

(g) ibid. pag. 3, 4.

'The *Chineſes* divide the Body into 'Three Regions: The Firſt is from the 'Head to the Diaphragm: The Second 'from thence to the Navel, containing 'Stomach, Spleen, Liver and Gall, and 'the Third to the Feet, containing

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'the Bladder, Ureters, Reins and Guts. 'To these Three Regions, they assign 'Three sorts of Pulses in each Hand. 'The uppermost Pulse is governed by the 'radical Heat, and is therefore in its own 'Nature overflowing and great. The 'lowermost is governed by the radical 'Moisture, which lies deeper than the 'rest, and is like a Root to the rest of 'the Branches: the middlemost lies be-'tween them both, partakes equally of 'radical Heat and Moisture, and answers 'to the middle Region of the Body, as 'the uppermost and lowermost do to the 'other Two. By these Three Sorts of 'Pulses, they pretend to examine all Sorts 'of acute Diseases, and these also are ex-'amined Three several Ways: Diseases 'in the Left-Side are shewn by the Pul-'ses of the Left-Hand, and Diseases in the 'Right-Side by the Pulses of the Right.

It would be tedious to dwell any longer upon such Notions as these, which every Page in *Cleyer*'s Book is full of: The Anatomical Figures annexed to the Tracts, which also were sent out of *China*, are so very whimsical, that a Man would almost believe the whole to be a Banter, if these Theories were not agreeable to the occasional Hints that may be found in the Travels of the Missionaries. This however,

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ever does no Prejudice to their Simple Medicines, which may, perhaps, be very admirable, and which a long Experience may have taught the *Chineſes* to apply with great Succeſs; and it is poſſible that they may ſometimes give not unhappy Gueſſes in ordinary Caſes, by feeling their Patients Pulſes: Still this is little to Phyſick, as an Art; and however the *Chineſes* may be allowed to be excellent Empiricks, as many of the *Weſt-Indian* Salvages are, yet it cannot be believed that they can be tolerable Philoſophers; which, in an Enquiry into the Learning of any Nation, is the firſt Queſtion that is to be conſidered.

But it is time now to leave thoſe Countries, in ſome of which there ſeems never to have been any ſolid Learning originally, and in the reſt but the Beginnings of it, to come to *Greece*, as it ſtood in the Age of *Ariſtotle*, *Theophraſtus*, *Euclid*, and thoſe other Great Men, who about the Time of *Alexander the Great*, and afterwards, did ſuch great Things in almoſt all Parts of real Learning. If upon Enquiry it ſhall be found that a Compariſon may be made between theſe Ancients and the Moderns, upon any Heads wherein Learning is principally concerned, which will not be to the Diſadvantage

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tage of the latter, then there needs not any Thing to be ſaid further. Whether it can or no, is now to be enquired.

CHAP. XIII.

Of the Logick and Metaphyſicks of the Ancient Greeks.

SInce all that has been ſaid in the Second and Third Chapters, concerning the *Ethicks*, *Politicks*, *Eloquence* and *Poeſie* of the Ancient *Grecians*, belongs to them in their moſt flouriſhing Ages, a great Part of the Subject Matter of this Enquiry has already been diſpatched. The remaining Parts of their Knowledge may be reduced to theſe Four Heads: *Logick*, *Metaphyſicks*, *Mathematicks* and *Phyſiology*. *Logick* is the *Art of Reaſoning*; but by it Men commonly underſtand the Art of Diſputing, and making Syllogiſms; of anſwering an Adverſary's Objections dexterouſly, and making ſuch others as cannot eaſily be evaded: In ſhort, of making a plauſible Defence, or ſtarting probable Objections, for or againſt any Thing. As this is taught in the Schools, it is certainly owing to the Ancients:

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cients: *Ariſtotle*'s *Organum* is the great Text by which Modern *Logicians* have framed their Syſtems; and nothing, perhaps can be deviſed more ſubtile in that captious Art *(h)*, than the *Sophiſms* of the Ancient *Stoicks*. But as *Logick* is truly the Art of Reaſoning juſtly, ſo as not only to be able to explain our own Notions, and prove our own Aſſertions, clearly and diſtinctly; but to carry our Speculations further than other Men have carried theirs, upon the ſame Arguments; it has not only been much cultivated by Modern Philoſophers, but as far purſued as ever it was by the Ancients: For hereby have the late Enquiries been made into *Phyſical*, *Metaphyſical* and *Mathematical* Matters, the Extent whereof is hereafter to be examined. Hereby the Ancient *Mathematicians* made their Diſcoveries, and when they had done they concealed their Art; for, though we have many noble Propoſitions of theirs, yet we have few Hints how they found them out; ſince the Knowledge of the fore-going Books in *Euclid*'s *Elements* is neceſſary to explain the Subſequent, but is of little or no Uſe to help us to find out any Propoſitions in the ſubſequent Books, (which are not immediate Corollaries from what went before) in caſe thoſe Books had been loſt.

(h) *Vide* A. Gellii Noct. Attic. lib. 1. cap. 2.

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Whether the Moderns have been deficient in this noble Part of *Logick*, may be ſeen by thoſe who will compare *Des Cartes*'s *Diſcourſe of Method*, Mr. *Lock*'s *Eſſay of Humane Underſtanding*, and *Tſchirnhaus*'s *Medicina Mentis*, with what we have of the Ancients concerning the *Art of Thinking*: Where, though it may be pretended that their Thoughts and Diſcoveries are not entirely new in themſelves, yet to us, at leaſt, they are ſo, ſince they are not immediately owing to ancient Aſſiſtances, but to their own Strength of Thought, and Force of Genius. And ſince this Art is, indeed, the Foundation of all Knowledge, I ought to take notice, that my Lord *Bacon* and *Des Cartes* were the two Great Men, who both found Fault with the *Logick* of the Schools, as inſufficient of it ſelf for the great Deſign of *Logick*, which is the Advancement of real Learning; and got Authority enough to perſuade the World, in a very great Degree, that other Methods muſt be taken, beſides making Syllogiſms; and ranking the Sorts of Things under Predicaments and Predicables, by thoſe who would go much farther than their Predeceſſors went before them. The true Uſe of the common *Logick*, being rather to explain what we know already, and to detect the Fallacies

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lacies of our Adverſaries, than to find that out, of which we before were ignorant. So that the Moderns have enlarged its Bottom; and by adding that *Deſideratum* which the Ancients either did not perfectly know, or, which is worſe, did invidiouſly conceal, namely, *the Method of diſcovering unknown Truths*, as Monſieur *Tſchirnhaus* calls it, have, if not made it perfect, yet put it into ſuch a Poſture, as that future Induſtry may very happily compleat it.

Metaphyſicks is properly that Science which teaches us thoſe Things that are out of the Sphere of Matter and Motion, and is converſant about God, and Spirits, and Incorporeal Subſtances. Of theſe Things *Plato* and his Diſciples wrote a great deal: They plainly ſaw, that ſomething beyond Matter was requiſite to create and preſerve the Auguſt Frame of the World. If we abſtract from Revelation, the *Carteſians* diſcourſe more intelligibly concerning them, than any of the Ancients. So that though very many of their particular Notions, as alſo of F. *Mallebranche*'s, *M. Poyret*'s, and other Modern *Metaphyſicians*, are juſtly liable to Exception, yet the main Foundations upon which they reaſon, are, for the moſt part, real; and ſo, by Conſequence, the Super-

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Superſtructures are not entirely fantaſtical: And therefore they afford a vaſt Number of Hints to thoſe who love to apply their Thoughts that Way, which are uſeful to enlarge Men's Underſtandings, and to guide their Manners. This, which is ſtrictly true of the Modern *Metaphyſicks*, is as much as can be ſaid of the Ancient: And becauſe a Compariſon cannot be made without reading their ſeveral Writings, the ſureſt Way to try the Truth of this Propoſition will be to read *Plato* and his Commentators; and along with them, *Des Cartes*'s *Meditations*, *Velthuyſius de Initiis primæ Philoſophiæ*, *Mallebranche*'s *Recherche de la Verité*, *Poyret*'s *Cogitationes de Deo*, and Mr. *Lock*'s *Eſſay of Humane Underſtanding*, already mentioned. This may be done without undervaluing what the Ancients wrote upon theſe noble Subjects: And the Queſtion is not, Whether they were great Men? But, Whether the Moderns have ſaid any Thing upon theſe Matters, without Copying out of other Men's Writings? Which, unleſs we will do them Wrong, we are bound to ſay they have.

CHAP.

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CHAP. XIV.

Of Ancient and Modern Geometry and Arithmetick.

IN the Method which I ſet to my ſelf in theſe *Reflections*, I choſe to begin with an Enquiry into thoſe Sciences, whoſe Extent is more liable to be conteſted; and ſo onwards, to thoſe which may more eaſily be determined. Monſieur *Perrault*, who has not finiſhed his *Parallel*, that I know of, took it for granted, that if the Prize were granted to the Moderns in *Eloquence*, in *Poeſie*, in *Architecture*, in *Painting*, and in *Statuary*, the Cauſe would be given up in every Thing elſe; and he, as the declared Advocate for the Moderns, might go on triumphantly with all the reſt. Wherein, poſſibly, he was not, in the main, much miſtaken. How he manages the remaining Part of his *Parallel*, I know not. I intend to begin with *Abſtracted Mathematicks*; both becauſe all its Propoſitions are of Eternal Truth, and beſides, are the Genuine Foundations upon which all real *Phyſiology* muſt be built.

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The Method which I ſhall follow is this: (1.) I ſhall enquire into the State of Ancient and Modern *Mathematicks*, without any particular Application of the Properties of the ſeveral Lines and Numbers, Surfaces and Solids, to Phyſical Things. (2.) I ſhall enquire what new Inſtruments have been invented, or old ones improved, by which the Knowledge of Nature of any ſort has been, or may be, further enlarged. (3.) I ſhall enquire whether any Improvements have been actually made of *Natural Hiſtory*, and of any *Phyſico-Mathematical* or *Phyſical* Sciences, ſuch as *Aſtronomy*, *Muſick*, *Opticks*, *Medicks*, and the like. (4.) From all this, I ſhall endeavour to paſs a Judgment upon the Ancient and Modern Ways of *Philoſophizing* concerning Nature in general, and its principal *Phænomena*, or *Appearances*.

I begin with *Geometry* and *Arithmetick*, becauſe they are general Inſtruments whereby we come to the Knowledge of many of the abſtruſeſt Things in Nature; ſince, as *Plato* ſaid of old, *God always Geometrizes in all his Works*. That this Compariſon might be the more exact, I deſired my learned and worthy Friend, Mr. *John Craige*, to give me his Thoughts upon this Matter: His own learned Writings

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tings upon the moſt difficult Parts of *Geometry*, for ſuch are the *Quadratures of Curve Lines*, will be ſufficient Vouchers for his Skill in theſe Things. I ſhall ſet down what he ſays, in his own Words.

'If we take a ſhort View of the *Geometry* of the Ancients, it appears, that they conſidered no *Lines*, except *Streight Lines*, the *Circle*, and the *Conick Sections*: As for the *Spiral*, the *Quadratrix*, the *Conchoid*, the *Ciſſoid*, and a few others, they made little or no Account of them. It is true, they have given us many excellent and uſeful Theorems concerning the Properties of theſe others; but far ſhort of what has been diſcovered ſince. Thus the *Quadrature* of the *Circle*, which did ſo much exerciſe and perplex the Thoughts of the Ancients; How imperfect is that of *Archimedes*, in compariſon of that exhibited by *Van Ceulen*? And every Body knows how this is exceeded by the later Performances of Mr. *Newton*, and Monſieur *Leibnitz*. *Archimedes*, with a great deal of Labour, has given us the exact *Quadrature* of the *Parabola*; but the Rectification of the *Parabolick Line*, depending on the *Quadrature* of the *Hyperbola*, is the Invention of this laſt Age. The rare Properties of the *Conick Sections*

'*ctions*, in the *Reflexion* and *Refraction* 'of *Light*, are the undoubted Discoveries 'of these later Times. It were easie to 'give more Instances of this Nature, but 'these are sufficient to shew how far the 'Modern Mathematicians have out-done 'the Ancients, in discovering the noblest 'and usefullest Theorems, even of those 'few Figures which they chiefly consi-'dered.

'But all this is nothing, in Compari-'son of that boundless Extent which the 'Modern Mathematicians have carried 'Geometry on to: Which consists in their 'receiving into it all the *Curve Lines* in 'Nature, together with the *Area's* and '*Solids* that result from them; by distin-'guishing them into certain *Kinds*, and '*Orders*; by giving general Methods of 'describing them, of determining their '*Tangents*, their *Lengths*, their *Area's*, 'and the *Solids* made by the Rotation of 'them about their Axes. Add to all this, 'the general Methods that have been in-'vented of late for finding the Properties 'of a great Number of these *Curves*, for 'the Advancement of *Opticks*, *Mecha-'nicks*, and other Parts of *Philosophy*: 'And let any Man of Sense give the Pre-'ference to the Ancient Geometry if he 'can.

'That

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'That the Ancients had general Methods of Conſtructing all plain Problems 'by a ſtreight Line and a Circle, as alſo 'all Solid Problems by the help of a Conick Section, is moſt certain. But it is 'as certain that here they ſtopped, and 'could go no further, becauſe they would 'not receive any Order of Curves beyond 'the Conick Sections, upon ſome nice 'Scrupuloſity in multiplying the Number 'of the *Poſtulata*, requiſite to the deſcribing of them. Whereas the Modern 'Geometers, particularly the renowned '*Des Cartes*, have given general Rules 'for Conſtructing all Problems of the '5th. or 6th. Degree. Which Method, 'if rightly underſtood, is applicable to all 'Problems of any Superior Order.

'How deficient the Geometry of the 'Ancients was in that Part which related 'to the *Loca Geometrica*, is manifeſt from 'the Account that *Pappus* gives us of that 'Queſtion, about which *Euclid* and *Apollonius* made ſo many ineffectual Attempts: The Solution whereof we owe 'entirely to Mr. *Iſaac Newton (i)*. For 'it is evident that *Des Cartes* miſtook 'the true Intent of the Ancients in this 'Matter. So that the *Loca Solida* is 'now one of the perfecteſt Parts of Geometry that we have; which before

(i) Philoſ. P. 74, 75.

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'was one of the moſt confuſed, and de-
'fective.

'From comparing the Ancient and
'Modern Geometry, I proceed to the
'Compariſon of thoſe Arts, to which we
'owe the Improvements both of the one,
'and the other. Theſe are chiefly Two,
'*viz. Algebra*, and the *Method of Indivi-*
'*ſibles*. As to the latter of theſe, I ſhall
'not ſtand to enquire whether *Cavallerius*
'was the firſt Inventor, or only the Re-
(k) Hiſtory of Algebra, pag. 285. 'ſtorer of it. I know *(k)* Dr. *Wallis* is of
'Opinion that it is nothing but the An-
'cients *Method of Exhauſtions*, a little diſ-
'guiſed. It is enough for your Purpoſe,
'that by the help of *Cavallerius*'s Method,
'Geometry has been more promoted in
'this laſt Age, than it was in all the Ages
'before. It not only affords us neat and
'ſhort Demonſtrations, but ſhews us how
'to find out the abſtruſeſt Theorems in
'Geometry. So that there has hardly been
'any conſiderable Improvement of late,
'which does not owe its Riſe to it; as any
'Man may ſee, that conſiders the Works
'of *Cartes*, *Fermat*, *Van Heuruet*, *Huygens*,
'*Neil*, *Wallis*, *Barrow*, *Mercator*, *Leib-*
'*nitz*, and *Newton*. *Archimedes*'s Pro-
'poſitions of the Properties of a Sphere
'and a Cylinder, are ſome of the eaſieſt
'Examples of this Method. How vaſtly
'more

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'more curious, and more uſeful Theo-
'rems have been ſince added to Geome-
'try, is known to every one that is con-
'verſant in the afore-mentioned Authors;
'eſpecially Mr. *Newton*, *Leibnitz* and
'*Huygens*: To inſtance particulars, were
'to tranſcribe their whole Books and
'Treatiſes.

'Let us, in the next Place, compare
'the *Ancient* and *Modern Algebra*. That
'the Ancients had ſome kind of *Algebra*,
'like unto ours, is the Opinion of ſeveral
'learned Writers of late: And it is evi-
'dent from the Seven remaining Books of
'*Diophantus*, that it was brought to a
'conſiderable Length in his Time. But
'how infinitely ſhort this was of that *Al-
'gebra* which we now have, ſince *Vieta*'s
'Time, will appear to any that conſiders
'the different Proceſs of both. For, tho'
'*Diophantus* has given us the Solution of
'a great many hard and knotty Arithme-
'tical Problems, yet the laſt Step of his
'Reſolution ſerves only for one particular
'Example of each Problem: So that for
'every new Example of the ſame Que-
'ſtion, there muſt be a new Proceſs made
'of the whole *Analyſis*. Whereas by our
'Modern *Algebra*, the *Analyſis* of any
'one Caſe gives a general Canon for all
'the infinite Caſes of each Problem;

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'whereby we discover many curious 'Theorems about the Properties of Numbers, not to be attained by *Diophantus*'s 'Method; this being the peculiar Advantage of *Specious Algebra*, first introduced by *Vieta*, and wonderfully promoted by several worthy Mathematicians since. Beside this intolerable Imperfection of the Ancient *Algebra*, used by *Diophantus*, which required as many different Operations as the Problem had different Examples, that is, infinite; all which are included in one general Solution by the Modern *Algebra*; there is this great Defect in it, that in *Undetermined Questions*, which are capable of innumerable Solutions, *Diophantus*'s *Algebra* can seldom find any more than one; whereas, by the Modern *Algebra*, we can find innumerable, sometimes all in one Analysis; though in many Problems we are obliged to re-iterate the Operation for every new Answer. This is sufficient to let you see, that (even in the Literal Sense) our *Algebra* does infinitely exceed that of the Ancients. Nor does the Excellency of our *Algebra* appear less in the great Improvements of Geometry. The reducing all Problems to Analytical Terms, has given Rise to those many excellent

'Methods,

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'Methods, whereby we have advanced 'Geometry infinitely beyond the Limits 'assigned to it by the Ancients. To this 'we owe, (1.) The Expressing all Curves 'by Equations, whereby we have a View 'of their Order, proceeding gradually on '*in infinitum*. (2.) The Method of 'Constructing all Problems of any As-'signable Dimension; whereas the An-'cients never exceeded the Third. Nay, 'from the Account which *Pappus* gives us 'of the afore-mentioned Question, it is 'evident, that the Ancients could go no 'further than Cubick Equations: For he 'says expressly, they knew not what to 'make of the continual Multiplication of 'any Number of Lines more than Three; 'they had no Notion of it. (3.) The 'Method of Measuring the *Area's* of ma-'ny Infinities of Curvilinear Spaces; 'whereas *Archimedes* laboured with great 'Difficulty, and wrote a particular Trea-'tise of the Quadrature of only one (*l*), 'which is the simplest and easiest in Na-'ture. (4.) The Method of Determi-'ning the Tangents of all Geometrick 'Curve Lines; whereas the Ancients 'went no further than in determining 'the Tangents of the Circle and Conick 'Sections. (5.) The Method of Deter-'mining the Lengths of an infinite Num-

(l) *The* Parabola.

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'ber of Curves; whereas the Ancients 'could never meaſure the Length of one. 'If I ſhould deſcend to Particulars, the 'Time would fail me. As our *Algebra*, 'ſo alſo our *Common Arithmetick* is prodi-'giouſly more perfect than theirs; of 'which, *Decimal Arithmetick* and *Loga-'rithms* are ſo evident a Proof, that I 'need ſay no more about it.

'I would not be thought, however, 'to have any Deſign to ſully the Reputa-'tion of thoſe Great Men, *Conon*, *Ar-'chimedes*, *Euclid*, *Apollonius*, *&c.* who, 'if they had lived to enjoy our Aſſiſtance, 'as we now do ſome of theirs, would, 'queſtionleſs, have been the greateſt Or-'naments of this Age, as they were de-'ſervedly the greateſt Glory of their own. Thus far Mr. *Craig*.

Thoſe that have the Curioſity to ſee ſome of theſe Things proved at large, which Mr. *Craig* has contracted into one View, may be amply ſatisfied in Dr. *Wallis*'s *Hiſtory of Algebra*, joyned with *Gerhard Voſſius*'s *Diſcourſes De Scientiis Mathematicis*.

It muſt not here be forgotten, that Abſtracted Mathematical Sciences were exceedingly valued by the ancienteſt Philoſophers: None that I know of expreſſing a Contempt of them but *Epicurus*, tho'

all

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all did not ſtudy them alike. *Plato* is ſaid to have written over the Door of his Academy, *Let no Man enter here, who does not underſtand Geometry.* None of all the learned Ancients has been more extolled by other learned Ancients, than *Archimedes.* So that if in theſe Things the Moderns have made ſo great a Progreſs, this affords a convincing Argument, that it was not Want of Genius which obliged them to ſtop at, or to come behind the Ancients in any Thing elſe.

CHAP. XV.

Of ſeveral Inſtruments invented by the Moderns, which have helped to advance Learning.

HAving now enquired into the State of Mathematicks, as they relate to Lines and Numbers in general, I am next to go to thoſe Sciences which conſider them as they are applied to Material Things. But theſe being of ſeveral Sorts, and of a vaſt Extent, taking in no leſs than the whole Material World, it ought

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ought to be observed, that they cannot be brought to any great Perfection, without Numbers of Tools, or Arts, which may be of the same Use as Tools, to make the Way plain to several Things, which otherwise, without their Help, would be inaccessible.

Of these Tools, or Instruments, some were anciently invented, and those Inventions were diligently pursued: Others are wholly new. According to their Uses, they may be ranged under these two General Heads: (1.) Those which are useful to all Parts of Learning, though perhaps not to all alike. (2.) Those which are particularly subservient to a Natural Philosopher, and a Mathematician. Under the first Head one may place *Printing*, and *Engraving*. Under the latter come *Telescopes*, *Microscopes*, the *Thermometer*, the *Baroscope*, the *Air-Pump*, *Pendulum-Clocks*, *Chymistry*, and *Anatomy*. All these, but the two last, were absolutely unknown to former Ages: *Chymistry* was known to the *Greeks*, and from them carried to the *Arabs*. *Anatomy* is, at least, as old as *Democritus* and *Hippocrates*; and among the *exact Egyptians*, something older.

The Use of *Printing* has been so vast, that every thing else wherein the Moderns have

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have pretended to excel the Ancients, is almoſt entirely owing to it? And withal, its general Uſes are ſo obvious, that it would be Time loſt to enlarge upon them; but it muſt be taken Notice of, becauſe Sir *William Temple* has queſtioned *(m)* *whether* Printing *has multiplied Books, or only the Copies of them*, from whence he concludes, that we are not to ſuppoſe that the Ancients had not equal Advantages by the Writings of thoſe that were ancient to them, as we have by the Writings of thoſe that are ancient to us. But he may eaſily ſolve his own Doubt, if he does but reflect upon the Benefit to Learning which ariſes from the *multiplying Copies* of good Books: For though it ſhould be allowed, that there were anciently as many Books as there are now, which is ſcarce credible, yet ſtill the Moderns have hereby a vaſt Advantage, becauſe, (1.) Books are hereby much cheaper, and ſo come into more Hands. (2.) They are much more eaſily read; and ſo there is no Time loſt in poring upon bad Hands, which waſtes Time, wearies the Reader, and ſpoils Mens Eyes. (3.) They can be printed with Indexes, and other neceſſary Diviſions, which, though they may be made in *MSS.* yet they will make them ſo voluminous and cumberſome,

(m) Pag. 6.

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ſome, that not one in Forty who now mind Books, becauſe they love Reading, would then apply themſelves to it. (4.) The Notice of new and excellent Books is more eaſily diſperſed. (5.) The Text is hereby better preſerved entire, and is not ſo liable to be corrupted by the Ignorance or Malice of Tranſcribers; this is of great Moment in Mathematicks, where the Alteration of a Letter, or a Cypher, may make a Demonſtration unintelligible. But to ſay more upon this Subject would be to abuſe Mens Patience, ſince theſe things, if not ſelf-evident, yet need no Proof.

Engraving upon Wood, or Copper, is of great Uſe in all thoſe Parts of Knowledge where the Imagination muſt be aſſiſted by ſenſible Images. For want of this noble Art, the *Ancient Books* of *Natural Hiſtory* and *Mechanical Arts*, are almoſt every where obſcure; in many Places unintelligible. *Mathematical Diagrams*, which need only a Ruler and a pair of Compaſſes, have been better preſerved, and could with more Eaſe be drawn: But in *Anatomy*, in *Mechanicks*, in *Geography*, in all Parts of *Natural Hiſtory*, *Engraving* is ſo neceſſary, and has been ſo very advantageous, that without it, many of thoſe Arts and Sciences would to this Hour

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Hour have received very little Increaſe. For when the Images, the Proportions, and the Diſtances of thoſe things wherein a Writer intends to inſtruct his Reader, are fully and minutely engraven in Prints, it not only ſaves Abundance of Words, by which all Deſcriptions muſt of Neceſſity be obſcured, but it makes thoſe Words which are uſed, full and clear; ſo that a skillful Reader is thereby enabled to paſs an exact Judgment, and can underſtand his Authors without a Maſter, which otherwiſe it would be impoſſible to do; ſo as to be able to diſcern all, even the minuteſt Miſtakes and Overſights in their Writings, which puts an end to Diſputes, and encreaſes Knowledge.

Theſe are general Inſtruments, and more or leſs ſerviceable to all ſorts of learned Men in their ſeveral Profeſſions and Sciences: Thoſe that follow are more particular: I ſhall begin with thoſe that aſſiſt the Eye, either to diſcern Objects that are too far off, or too ſmall.

The *Imperfections* of *Diſtance* are remedied in a great Meaſure by *Teleſcopes*; whoſe chief Uſe, that comes under our Conſideration, is to diſcern the Stars, and other celeſtial Bodies.

To find out the firſt Inventor of theſe ſorts of Glaſſes, it will be neceſſary to learn

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learn who first found out the Properties of Convex and Concave Glasses in the Refraction of Light. Dr. *Plot* has collected a great deal concerning F. *Bacon*, in his *Natural History of Oxfordshire*; which seems to put it out of doubt that he knew that great Objects might appear little, and small Objects appear great; that distant Objects would seem near, and near Objects seem afar off, by different Applications of Convex and Concave Glasses; upon the Credit of which Authorities, Mr. *Molineux (n)* attributes the Invention of Spectacles to this learned Friar, the Time to which their earliest Use may be traced, agreeing very well with the Time in which he lived; but how far F. *Bacon* went, we know not: So that we must go into *Holland* for the first Inventors of these excellent Instruments, and there they were first found out by one *Zacharias Joannides (o)*, a Spectacle-maker *(p)* of *Middleburgh* in *Zeland*; in 1590 *(q)* he presented a Telescope of Two Glasses to Prince *Maurice*, and another to Arch-Duke *Albert*, the former of whom apprehending that they might be of great Use in War, desired him to conceal his Secret. For this Reason, his Name was so little known, that neither *Des Cartes (r)* nor *Gerhard Vossius (s)*

(n) Dioptric. Pag. 256, 257, 258.

(o) Borellus *de vero Inventore Telescopii*, pag. 30.

(p) Ibid. Pag. 35.

(q) Ibid. Pag. 30.

(r) Dioptric.

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sius (*f*) had ever heard any thing of him, when they attributed the Invention of Teleſcopes to *Jacobus Metius* of *Alkmaer*. However it taking Air, *Galileo Galilei* took the Hint, and made ſeveral Teleſcopes, by which making Obſervations upon heavenly Bodies, he got himſelf immortal Honour. Thereby (*t*) he diſcovered Four Planets moving conſtantly round *Jupiter*, from thence uſually called his Satellits, which afterwards were obſerved to have a conſtant, regular, and periodical Motion. This Motion is now ſo exactly known, that Mr. *Flamſtead*, who is one of the moſt accurate Obſervers that ever was, has been able to calculate Tables of the Eclipſes of the ſeveral Satellits, according to which, Aſtronomers in different quarters of the World, having Notice of the preciſe Time when to look for them, have found them to anſwer to his Predictions, and publiſhed their Obſervations accordingly. This is an effectual Anſwer to all that Rhapſody which *Stubbe* (*u*) has collected in his Brutal Anſwer to Mr. *Glanvile*'s *Plus Ultra*, about the Uncertainty of all Obſervations made by Teleſcopes; ſince it is impoſſible to calculate the Duration of any Motion juſtly by fallacious and uncertain Methods. By the Eclipſes of *Jupiter*'s

(*f*) *De ſcientiis Mathemat.* p. 70.

(*t*) *Vide* Galilæi Nuntium *ſidereum primò ni fallor, impreſſum*, A. D. MDCVIII.

(*u*) *Plus Ultra* reduced to a Non-plus. Pag. 28, 36.

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Jupiter's Satellits, Longitudes would soon be exactly determined if Tubes of any Length could be managed at Sea. (*w*) But *Jupiter* is not the only Planet about which things anciently unknown have been revealed by this noble Instrument. The Moon has been discovered to be an Earth endued with a libratory Motion, of an uneven Surface, which has something analogous to Hills and Dales, Plains and Seas; and a new Geography (if one may use that Word without a Blunder) with accurate Maps has been published by the great *Hevelius* (*x*), and improved by *Ricciolus* (*y*), by which Eclipses may be observed much more nicely than could be done formerly: The Sun has been found to have Spots at some times; the Planets to move round their Axes; *Saturn* to have a Luminous Ring round about his Body, which in some Positions appears like two Handles, as they are commonly called, or large Prominencies on opposite Parts of his Limbs, carried along with him, beside Five Planets moving periodically about him, as those others do about *Jupiter*: The milky Way to be a Cluster of numberless Stars; the other parts of the Heaven to be filled with an incredible Number of fixed Stars, of which, if *Hevelius*'s Globes are ever pub-

(w) *Vide* Philosoph. Transact. n. 177.

(x) Selenograph.

(y) Almagest.

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publiſhed, the World may hope to ſee a Catalogue. Theſe are ſome of the remarkable Diſcoveries that have been made by *Teleſcopes:* And as new Things have been revealed, ſo old ones have been much more nicely obſerved, than formerly it was poſſible to obſerve them.

But I need not enlarge upon particular Proofs of that, which every Aſtronomical Book, printed within theſe Fifty Years, is full of. If I ſhould, it would be ſaid, perhaps, that I had only copied from the *French* Author *of the Plurality of Worlds*, ſo often mentioned already.

As ſome Things are too far off, ſo others are too ſmall to be ſeen without help. This laſt Defect is admirably ſupplied by *Microſcopes*, invented by the ſame *Zacharias Joannides (z)*; which, beſides Miſcellaneous and Occaſional Obſervations, have been applied to *Anatomy*, by *Malpighius*, *Leeuwenhoeck*, *Grew*, *Havers*, and ſeveral others. The firſt very conſiderable Eſſay to ſhew what might be diſcovered in Nature, by the help of *Microſcopes*, was made by Dr. *Hook*, in his *Micrography*; wherein he made various Obſervations, upon very different Sorts of Bodies. One may eaſily imagine what Light they muſt needs give unto the nicer Mechaniſm of moſt Kinds of Bodies,

(z) Borellus, *ubi ſupra*, p. 35.

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when Monsieur *Leeuwenhoeck* has plainly proved, that he could, with his Glasses, discern Bodies several Millions of Times less than a Grain of Sand. This may be relied upon, because Dr. *Hook*, who examined what *Leeuwenhoeck* says of the little Animals which he discerned in Water, of which he tells the most wonderful Things, does, in his *Microscopium*, attest the Truth of *Leeuwenhoeck*'s Observations.

Besides these which are of more universal Use, several other *Instruments* have been invented, which have been very serviceable to find out the Properties of Natural Bodies; and by which several Things of very great Moment, utterly unknown to the Ancients, have been detected. As,

(a) Borellus *de motu Animalium* Part. II. Prop. clxxv.

1. The *Thermometer*, invented *(a)* by *Sanctorius*, an eminent Physician of *Padua*. Its immediate Use is, to determine the several Degrees of Heat and Cold; of which our Senses can give us but uncertain Notices; because they do not so much inform us of the State of the Air in it self, as what its Operations are at that Time upon our Bodies. But *Sanctorius* used only open Vessels, which are of small Use, since Liquors may rise or fall in the Tubes, as well from the Increase or Dimi-

Diminution of the Weight of the Air, as of Heat and Cold. That Defect was remedied by Mr. *Boyle* (*b*), who ſealed up the Liquors in the Tubes, Hermetically, that ſo nothing but only Heat and Cold might have any Operation upon them. The Uſes to which they have been applied, may be ſeen at large in Mr. *Boyle*'s *Hiſtory of Cold*, and *the Experiments of the Academy* del Cimento.

(b) *See his* Thermometrical Thoughts, *prefixed to his* Hiſtory of Cold.

2. The *Baroſcope*, or *Torricellian Experiment*; ſo called from its Inventor, *Evangeliſta Torricelli*, a *Florentine* Mathematician; who, about the Year 1643. found that Quick-Silver would ſtand erect in a Tube, above 28 Inches from the Surface of other Quick-Silver into which the Tube was immerſed, if it was before well purged of Air. This noble Experiment ſoon convinced the World, that the Air is an actually heavy Body, and gravitates upon every Thing here below. This Gravitation being found unequal at ſeveral Times, Mr. *Boyle* applied this Inſtrument to Mechanical Uſes (*c*), and ſhewed how it might teach us to know the Differences and Changes of Weather; when dry, and when wet; ſince, by a vaſt Number of Obſervations, he had learnt, that in dry Weather the Air drove up the *Mercury*, and in wet

(c) Philoſ. Tranſact. Num. 9, 10, 11-55.

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Weather let it fall again; though never lower than 28 Inches, and ſcarce ever higher than 32.

3. Theſe Obſervations, with other Collateral Experiments, induced him to believe that the Air was, in Truth, a Springy Body, which expanded or contracted it ſelf in a Reciprocal Proportion, to the Increaſe or Leſſening of the Compreſſion of the Ambient Bodies. For which he invented an Inſtrument to draw the Air out of Veſſels that were filled with it, by Suction. The firſt Eſſays of that kind ſeem to have been made ſome Years before his appeared, by *Otto Guerick* of *Magdebourg*; but as he applied them chiefly to the Gravitation of the Air, without taking any notice of its Spring; ſo they were very imperfect, when compared to Mr. *Boyle*'s. By this *Air-Pump*, as it is uſually called, he diſcovered Abundance of Properties in the Air, before never ſuſpected to be in it. What they are, either conſidered ſingly, or in their Operations upon all ſorts of Bodies, may be ſeen at large in his *Phyſico-Mechanical Experiments concerning the Weight and Spring of the Air*; and in ſeveral of his other Diſcourſes upon the ſame Argument; ſome of which are printed by themſelves, and others in the *Phi-*

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Philoſophical Tranſactions (*d*). How far they may be relied upon appears from this; That though *Hobbes* and *Linus* have taken a great deal of Pains to deſtroy Mr. *Boyle*'s Theory, yet they have had few or no Abettors: Whereas the Doctrine *of the Weight and Spring of the Air*, firſt made thorowly intelligible by Mr. *Boyle*, has univerſally gained Aſſent from Philoſophers of all Nations who have, for theſe laſt Thirty Years, buſied themſelves about Natural Enquiries.

(d) Num. 62, 63, 122. Vide *Catalogue of Mr.* Boyle's *Works, at the End of the Firſt Part of the* Medicinal Experiments, *Printed* 1692. *in* Twelves.

4. The Invention of *Pendulum-Clocks* ought here to be remembred, ſince from them it appears, that the Diurnal Motion of the Earth is not ſo exactly Periodical, as that a true Equation of Time can thereby be obtained; but by this Inſtrument, the Meaſure of the Variation being once adjuſted, the true Time of the Earth's Diurnal Motion can, at all Seaſons of the Year, be more exactly known. The Uſe of it in making of Aſtronomical Obſervations is alſo very obvious; for they could not anciently be ſo minute as they are at preſent, for want of ſuch nice Sub-Diviſions of an equable Motion as it affords. The Invention of this noble Inſtrument is attributed, by the Publiſher of

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the Experiments of the Academy *del Cimento*, to *Galileo Galilei*, who found out ſo many excellent Theorems of the Nature and Proportions of the Motions of Projected and Vibrating Bodies. He ſays that *Galileo* firſt applied the *Pendulum* to *Clock-work*; and that his Son *Vincenzio* put it in practice in the Year 1649 (e). It was little taken notice of, however, in theſe Parts, till Monſieur *Huygens* revived or invented it a-new; to whom, for that Reaſon, the Glory of finding out this uſeful Inſtrument is commonly attributed. Upon this Occaſion I ought not to omit that great Improvement of Watches, by adding a Second Spring to balance the Firſt; (as the *Pendulum* in a Clock does the Weights) which alſo is attributed to Monſieur *Huygens*, though he and Dr. *Hook* have both contended for the Honour of this uſeful Invention. It appears by the *Philoſophical Tranſactions*, and by Dr. *Hook*'s *Lectures*, that he had a right Notion of this Matter, and that he had made ſeveral Eſſays to reduce it to Practice, ſome Years before any of Monſieur *Huygens*'s Watches were produced; but that Monſieur *Huygens* firſt made *Pendulum-Watches* (ſo they are commonly called) that proved thoroughly ſerviceable. Theſe will not be diſputed to be

(e) *Experiments of the Academy* del Cimento, p. 12. Edit. Eng.

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be Modern Inventions, since the whole Business of Clocks and Watches was unknown to all, even the *Arabian*, Antiquity (*f*): Their Astronomers measured their Time by Hour-Glasses of Water, or Vibrating Strings of several Lengths; which would, indeed, serve them, in most Cases, to measure Time nicely by, whilst they were observing; though they were of no Use upon other Occasions; and even then were liable to great Hazards.

(*f*) *See* Dr. Edw. Bernard's *Letter to* Dr. Huntingdon, *about the Latitude of Twenty Fixed Stars, from* Arabian *Observat.* Phil. Tranf.

CHAP. XVI.

Of Ancient and Modern Chymistry.

Chymistry, or the Art of Dividing Bodies by Fire, comes next to be considered. So great Things have thereby been discovered in Nature, that were unknown without it, that it may justly be esteemed as one of the chiefest Instruments whereby Real Knowledge has been advanced. It has been cultivated by three Sorts of Men, for very different Reasons; by *Refiners*, *Alchemists*, and *Chymists*, properly so called. The *Refiner's*

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Art, which is older than the Flood, is in *Holy Scripture* aſcribed to *Tubal-Cain*, as its firſt Inventor (*g*). The early Uſe of Gold and Silver, as Inſtruments of Exchange in Trade, in the Eaſtern Parts, ſhews, that Men very anciently knew how to ſeparate Metals from their Droſs, to a great Degree. And as frequent Purifications are neceſſary for that Work, ſo we find that the Neceſſity of them was long ago commonly known, ſince *David* compared a Righteous Man to Silver Seven Times purified in the Fire (*h*). Yet that their Art was comparatively rude, is certain, becauſe they did not know how to ſeparate Gold from Silver; beſides a very great many other Secrets relating to that Art, which could not be known before the Way of Making *Aquæ Fortes*: And their particular Qualities in corroding ſeveral ſorts of Metals were diſcovered, and applied to theſe Purpoſes.

(g) Gen. 4. 22.

(h) Pſal. 12. 6.

I have ſpoken already of *Alchemy*, or the Art of Making Gold; and ſo I ſhall paſs on to the *Chymiſt's Art*, which conſiſts in making ſuch Analyſes of Bodies by Fire, or other Agents, Chymically prepared, as may reduce them into more ſimple Subſtances, than thoſe out of which they were before compounded. The Diſcoveries which have been hereby made

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made are so very much later than those Ages which Sir *William Temple* contends for, that those who thought they had a great deal to say for the other Parts of *Chymistry*, do here give up the Controversie. *Borrichius* himself owns, that *Hippocrates*, *Aristotle* and *Galen* knew so little of *Chymistry*, that they could not so much as make *Rose-water*. Now, though he says this with a Design to disparage their Skill in Physick, when compared with the *Egyptian*, yet therein he destroys his own Hypothesis; because, in several Places of his *Vindication of the Hermetical and Chymical Philosophy and Medicine*, against *Conringius*'s Book *De Medicina Hermetica*, he takes Pains to prove, that the Knowledge of these very Men was originally owing to the *Egyptians*. But the Thing speaks it self: The inward Use of Antimonial, Vitriolick, and Mercurial Preparations in Physick, was very little known before the Time of *Basilius Valentinus*; and *Paracelsus*: What was ancienter, was taken from the *Arabs*, who are Moderns against Sir *William Temple*. (*i*) They may be looked upon as the first Inventors of Chymical Medicine: (*i*) They first extracted Vinous Spirits from Fermented Liquors: Not to mention

(ii) Borrichius *de Ortu & Prog. Chem.* Morhofius *ad Langelottium.*

tion Abundance of other Preparations, which *Arnoldus de Villa Nova*, *Raymund Lully*, his Scholar, and F. *Bacon* learned from them. I will not deny but ſome Chymical Experiments were very anciently known. *Solomon* (*k*) hints at the Diſagreement of *Vinegar* and *Nitre*; which, though not intelligible of common *Nitre*, yet, as Mr. *Boyle* (*l*) found by his own Experience, it is certainly true of *Egyptian Nitre*; which, as being a natural *Alkali*, will cauſe an Ebullition, when joined with any Acid Salt. The Property of *Mercury* to mix, or, as the *Chymiſts* ſpeak, to *Amalgamate* with Gold, was known in *Vitruvius*'s Time: Though by that one may perceive, that very few of its other Properties were then known; ſince *Pliny*, who mentions that Quality of *Mercury*, that it will *Amalgamate* with Gold, ſpeaks of it as a ſingular Thing, in theſe Words, (*m*) *Every Thing ſwims upon Quick-Silver but Gold; that only it draws to it ſelf.* Whereas now every Body knows that *Mercury* will *Amalgamate* with all Metals but Copper and Iron. And if the Ancients Skill in Minerals may be judged of by *Pliny*'s Accounts, they

(k) Prov. 25. 20.

(l) Boyle's Producibleneſs of Chymical Principles, p. 30, 31.

(m) *Omnia ei innatant præter aurum; id unum ad ſe trahit.* N. H. lib. xxxiii. cap. 6.

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they (*n*) believed that Lead was heavier, and more ductile than Gold.

(n) *Nec pondere aut facilitate materia prælatum eſt cæteris metallis, cum cedat per utrumque plumbo.* N. H. lib. xxxiiii. cap. 3.

Some Paſſages likewiſe are produced by *Borrichius*, to prove that the Ancients underſtood ſomething of Calcinations, and the Uſe of Lixiviate Salts: But theſe Things are very few, very imperfect, and occaſional. Chymiſtry was not eſteemed as a diſtinct Art; or the Analyſes thereby produced, worthy a Philoſopher's Notice; though the Induſtry of later Ages have found them to be ſo regular and remarkable, that many Perſons have thought that the Conſtituent Principles of Mixed Bodies are no other Way ſo certainly to be found out. Hence have the *Hypotheſes* of the *Paracelſians* taken their Beginning; who held, that *Salt*, *Sulphur* and *Mercury* were the active Principles of Compoſition of all Mixed Bodies. Hence ſeveral others have been led to believe, that the Primary Conſtituents of very many Bodies were *Acid* and *Alkalizate Salts*. Which Hypotheſes, though liable to many Exceptions, as Mr. *Boyle* (*o*) has fully proved, are founded upon ſuch a Variety of ſurprizing Experiments, that thoſe who firſt ſtarted

(o) Sceptical Chymiſt, *and* Product. of Chymical Principles.

ſtarted them were not ſo unadviſed, as one that is wholly unacquainted with the Laboratories of the *Chymiſts* might, at firſt View, ſuſpect. For it is certain, that five diſtinct and tolerably uniform Subſtances may be drawn from moſt Vegetable and Animal Subſtances, by Fire; namely, *Phlegm*, *Fixed Salt*, *Oil*, *Earth*, and *Spirit*, or Volatile Salt diſſolved in Phlegm. So that here is a new Field of Knowledge, of which the Ancients had no ſort of Notion.

The great and ſucceſsful Change hereby made (*p*) in the *Pharmaceutical* Part of Phyſick, ſhews that theſe Philoſophers by Fire have ſpent their Time to very good purpoſe. Thoſe Phyſicians who reaſon upon *Galenical* Principles acknowledge, that in very many Caſes, the *Tinctures*, *Extracts*, *Spirits*, *Volatile Salts*, and *Roſins* of Vegetables and Animals, are much more efficacious Remedies than the *Galenical* Preparations of thoſe ſelf-ſame Medicines. Nay, though they are not eaſily reconciled to Mineral Preparations, becauſe the Ancients not knowing how to ſeparate them from their groſſer Faces, durſt very ſeldom apply them to any but Chirurgical Uſes; yet they themſelves are forced to own, that ſome Diſeaſes are of ſo malignant a Nature, that they

(P) *See* Mr Boyle's Uſefulneſs of Experimental Philoſophy.

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they cannot be diſpelled by milder Methods. The Uſe of *Mercury* in Venereal Diſtempers, is ſo great, and ſo certain, that if there be ſuch a Thing as a Specifical Remedy in Nature, it may juſtly deſerve that Title. The Unskilfulneſs of thoſe who have prepared and adminiſtred Antimonial Medicines, has made them infamous with many Perſons, though many admirable Cures have been, and are wrought by them, skilfully corrected, every Day. And it is well known, that the inward Uſe of Steel has been ſo ſucceſsful, that in many Diſeaſes, where the niceſt Remedies ſeem requiſite, whether the Conſtitution of the Patients, or the Nature of the Diſtempers, be conſidered, it is, without Fear, made uſe of; tho' its Medicinal Virtues, in theſe Caſes, have been found out by Chymical Methods.

Upon the whole Matter, it is certain, that here is a new and gainful Acquiſition made: The old *Galenical Materia Medica* is almoſt as well known, in all probability, as ever it was; ſince there are ſo great Numbers of Receipts preſerved in the Writings of the old Phyſicians. The Induſtry of Modern Naturaliſts has, in moſt, at leaſt, in all material Caſes, clearly diſcovered what thoſe Individual Remedies

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Remedies are, which are there deſcribed. So that whatſoever Enlargement is made, is a clear Addition; eſpecially, ſince theſe Minerals and Metals were then as free and common as they are now. Beſides, vaſt Numbers of *Galenical* Medicines, Chymically prepared, are leſs naufeous, and equally powerful; which is ſo great an Advantage to Phyſick, that it ought not to be over-looked.

CHAP. XVII.

Of Ancient and Modern Anatomy.

Anatomy is one of the moſt neceſſary Arts to open to us Natural Knowledge of any that was ever thought of. Its Uſefulneſs to Phyſicians was very early ſeen; and the *Greeks* took great Pains to bring it to Perfection. Some of the firſt Diſſectors (*q*) tried their Skill upon living Bodies of Men, as well as Brutes. This was ſo inhumane and barbarous a Cuſtom, that it was ſoon left off: And it created ſuch an Abhorrence in Mens Minds of the Art it ſelf, that in *Galen*'s Time even dead Bodies were ſeldom opened; and he was often obliged

(q) Corn. Celſus *in Præfatione.*

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liged (*r*) to uſe Apes inſtead of Men, which ſometimes led him into great Miſtakes.

(r) Anat. Adminiſtrat. paſſim.

It may be ſaid, perhaps, that becauſe there is not an ancient Syſtem of Anatomy extant, therefore the Extent of their Knowledge in this particular cannot be known. But the numerous Anatomical Treatiſes of *Galen* do abundantly ſupply that Defect. In his elaborate Work *of the Uſes of the Parts of Humane Bodies*, he gives ſo full an Idea of ancient Anatomy, that if no other ancient Book of Anatomy were extant, it alone would be ſufficient for this purpoſe. He is very large in all his Writings of this Kind, in taking Notice of the Opinions of the Anatomiſts that were ancienter than himſelf, eſpecially when they were miſtaken, and had ſpent much Time and Pains in opening Bodies of Brutes, of which he ſomewhere promiſes to write a comparative Anatomy. So that his Books not only acquaint us with his own Opinions, but alſo with the Reaſonings and Diſcoveries of *Hippocrates*, *Ariſtotle*, *Herophilus* and *Eraſiſtratus*, whoſe Names were juſtly venerable for their Skill in theſe things. Beſides, he never contradicts any Body without appealing to Experience, wherein though he was now and then

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then miſtaken, yet he does not write like a Pedant, affirming a thing to be true or falſe upon the Credit of *Hippocrates*, or *Herophilus*, but builds his Argument upon Nature as far as he knew her. He had an excellent Underſtanding, and a very piercing Genius, ſo that the falſe uſes which he very frequently aſſigns to ſeveral Parts, do certainly ſhew that he did not underſtand the true Texture of thoſe Parts, becauſe where his Anatomy did not fail him, his Ratiocinations are, generally ſpeaking, exact. Wherefore in this particular his Miſtakes inſtruct us as effectually in the Ancients Ignorance, as his true Notions do in their Knowledge. This will appear at large hereafter, where it will be of mighty uſe to prove, That the Ancients cannot be ſuppoſed to have known many of the moſt eminent Modern Diſcoveries, ſince if they had known them, they would not have aſſigned ſuch Uſes to thoſe Parts, as are not reconcilable to thoſe Diſcoveries. If *Galen* had known that the Pancreas had been a Heap of ſmall Glands, which all emit into one common Canal, a particular Juice carried afterwards through that Canal into the Guts; which there meeting with the Bile goes forwards, and aſſiſts it in the making of the Chyle, he would

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would never have ſaid (ſ) that Nature made it for a Pillow to ſupport the Veins; which go out of the Liver in that Place, where they divide into ſeveral Branches, leſt if they had been without a Reſt, they ſhould have been hurt by the violent Eruption of the Blood; and this too without the aſſigning any other Uſe for it.

(ſ) De uſu Partium, lib. V. cap. 2.

By *Anatomy* there is ſeldom any thing underſtood but the Art of laying open the ſeveral Parts of the Body with a Knife, that ſo the Relation which they ſeverally bear each to other may be clearly diſcerned. This is generally underſtood of the *containing* Parts, Skin, Fleſh, Bones, Membranes, Veins, Arteries, Muſcles, Tendons, Ligaments, Cartilages, Glands, Bowels, wherein only the Ancients buſied themſelves: As for the Examination of the Nature and particular Texture of the *contained* Parts, Blood, Chyle, Urine, Bile, Serum, Fat, Juices of the Pancreas, Spleen and Nerves, Lympha, Spittle, Marrow of the Bones, Mucilages of the Joints, and the like; they made very few Experiments, and thoſe too for want of Chymiſtry very imperfect. The Diſcoveries therefore which have been made in that nobler part, which are numerous and conſiderable, are in a manner wholly owing to later Ages. In the other, a

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great deal was anciently done, though a great deal more was left for Posterity to do.

I shall begin with the Body in general. It is certain that all the great Divisions of the Bones, Muscles, Veins and Arteries; most of the visible Cartilages, Tendons and Ligaments, were very exactly known in *Galen*'s Time; the Positions of the Muscles, their several Originations, the Insertions of their Tendons, and investing Membranes, were, for the most part, traced with great Nicety and Truth; the more conspicuous pairs of Nerves which arise either from the Brain or Spinal Marrow, were very well known and carefully followed; most of the great Branches of the Veins and Arteries; almost all the Bones and Cartilages, with very many Muscles, have still old *Greek* Names imposed upon them by the Old Anatomists, or *Latin* Names translated from the *Greek* ones: So that, not only the easie things and such as are discernable at first Sight, were throughly known; but even several particulars, especially in the Anatomy of Nerves, were discovered, which are not obvious without great Care, and a good deal of practical Skill in dissecting. So much in general; from which it is evident, that as far as Anatomy is peculiarly useful to a Chirurgeon, to inform him

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him how the Bones, Muſcles, Blood-Veſſels, Cartilages, Tendons, Ligaments and Membranes lie in the Limbs and more conſpicuous Parts of the Body, ſo far the Ancients went: And here, there is very little that the Moderns have any Right to pretend to as their own Diſcoveries; though any Man, that underſtands theſe things, muſt own, That theſe are the firſt things which offer themſelves to an Anatomiſt's View.

Here I ſhall beg Leave to deſcend to Particulars, becauſe I have not ſeen any Compariſon made between *Ancient and Modern Anatomy*, wherein I could acquieſce; whilſt ſome, as Mr. *Glanvile (t)*, and ſome others who ſeem to have copied from him, have allowed the Ancients leſs than was their Due; others, as *Vander Linden* and *Almeloveen (u)*, have attributed more to them than came to their Share; eſpecially ſince (though perhaps it may be a little tedious, yet) it cannot be called a Digreſſion.

(t) *Eſſay of Modern Improvements of uſeful Knowledge.*

(u) Inventa Nov. Antiqua.

Hippocrates (w) took the Brain to be a Gland. His Opinion was nearer to the Truth than any of his Succeſſors; but he ſeems to have thought it to be a ſimilar Subſtance, which it evidently is not. And therefore, when ſeveral Parts of it were diſcovered not to be glandulous,

(w) De Glandulis pag. 418. §. 7. Edit. *Vander Linden.*

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his Opinion was rejected. *Plato* took it to be Marrow, ſuch as nouriſhes the Bones; but its Weight and Texture ſoon deſtroyed his Notion, ſince it ſinks in Water wherein Marrow ſwims; and is hardned by Fire, by which the other is melted. *Galen* (x) ſaw a little farther, and he aſſerts it to be of a nervous Subſtance, only ſomething ſofter than the Nerves in the Body. Still they believed that the Brain was an uniform Subſtance, and as long as they did ſo, they were not like to go very far. The firſt Anatomiſt who diſcovered the true Texture of the Brain was *Archangelus Piccolhomineus* (y) an *Italian*, who lived in the laſt Age. He found that the Brain properly ſo called, and *Cerebellum*, conſiſt of Two diſtinct Subſtances, an outer Aſh-coloured Subſtance, through which the Blood-Veſſels which lie under the *Pia Mater* in innumerable Folds and Windings, are diſſeminated; and an inner every where united to it, of a nervous Nature, that joins this Bark (as it is uſually called) to the *Medulla Oblongata*, which is the Original of all the Pairs of Nerves that iſſue from the Brain, and of the Spinal Marrow, and lies under the Brain and *Cerebellum*. After him Dr. *Willis* (z) was ſo very exact, that he traced this medullar Subſtance through all its

(x) De uſu Partium, lib. VIII. cap. 6.

(y) Malpighius Epiſt. de Cerebro ad Fracaſſatum, p. 2.

(z) Anat. Cerebri.

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its Inſertions into the Cortical, and the *Medulla Oblongata*, and examined the Riſes of all the Nerves, and went along with them into every Part of the Body with wonderful Curioſity. Hereby not only the Brain was demonſtrably proved to be the Fountain of Senſe and Motion, but alſo by the Courſes of the Nerves, the Manner how every Part of the Body conſpires with any others to procure any one particular Motion, was clearly ſhewn; and thereby it was made plain even to Senſe, that where-ever many parts joined at once to cauſe the ſame Motion, that Motion is cauſed by Nerves that go into every one of thoſe Parts, which are all ſtruck together. And though *Vieuſſens* and *du Verney* have in many things corrected Dr. *Willis*'s *Anatomy of the Nerves*; yet they have ſtrengthened his general Hypotheſis, even at the Time when they diſcovered his Miſtakes, which is the ſame thing to our preſent purpoſe. *Galen*, indeed (*a*), had a right Notion of this matter, but he traced only the larger Pairs of Nerves, ſuch as could not eſcape a good Anatomiſt.

(a) De V. P. l. 8. c. 4.

But the manner of the forming of the *Animal Spirit* in the Brain was wholly unknown. In Order to the Diſcovery whereof, *Malpighius* (*b*) by his Microſcopes found that the Cortical Part of

(b) De Cerebri Cortice.

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the Brain consists of an innumerable Company of very small Glandules, which are all supplied with Blood by Capillary Arteries; and that the Animal Spirit, which is separated from the Mass of the Blood in these Glandules, is carried from them into the *Medulla Oblongata* through little Pipes, whereof one belongs to every Gland, whose other End is inserted into the *Medulla Oblongata*, and that these Numberless Pipes, which in the Brain of some Fishes look like the Teeth of a small Ivory Comb (c), are properly that which all Anatomists after *Piccolhomineus* have called the *Corpus callosum*, or the Medullar Part of the Brain. This Discovery destroys the Ancient Notions of the Uses of the Ventricles of the Brain, and makes it very probable that those Cavities are only Sinks to carry off excrementitious Humours, and not Store-Houses of the Animal Spirit: It shews likewise how little they knew of the Brain who believed that it was an uniform Substance. Some of the Ancients disputed (d) whether the Brain were not made to cool the Heart. Now though these are ridiculed by *Galen*, so that their Opinions are not imputable to those who never held them; yet they shew that these famous Men had examined these things very superficially:

(c) De Cerebro, pag. 4.

(d) *Galen* de V. P. l. 8. c. 2.

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cially: For no Man makes himſelf ridiculous if he can help it; and now, that Mankind are ſatisfied by ocular Demonſtration that the Brain is the Original of the Nerves, and the Principle of Senſe and Motion, he would be thought out of his Wits that ſhould doubt of this Primary uſe of the Brain, though formerly when things had not been ſo experimentally proved, Men might talk in the dark, and aſſign ſuch Reaſons as they could think of, without the Suſpicion of being ignorant or impertinent.

The *Eye* is ſo very remarkable a Member, and has ſo many Parts peculiar to its ſelf, that the Ancients took great Notice of it. They found its Humours, the watry, cryſtalline, and glaſſy, and all its Tunicles, and gave a good Deſcription of them; but the Optick Nerve, the aqueous Ducts which ſupply the watry Humour, and the Veſſels which carry Tears were not enough examined. The firſt was done by Dr. *Briggs (e)*, who has found that in the *Tunica Retiformis*, which is contiguous to the glaſſy Humour, the Filaments of the Optick Nerve there expanded, lie in a moſt exact and regular Order, all parallel one to another, which when they are united afterwards in the Nerve are not ſhuffled confuſedly toge-

(e) Theory of Viſion. *Grew's* Tranſact. numb. 6, and Philoſ. Tranſact. numb. 147.

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ther, but ſtill preſerve the ſame Order till they come to the Brain. The cryſtalline Humour had already been diſcovered to be of a Double-Convex Figure, made of Two unequal Segments of Spheres, and not perfectly ſpherical as the Ancients thought. So that this further Diſcovery made by Dr. *Briggs*, ſhews evidently why all the Parts of the Image are ſo diſtinctly carried to the Brain, ſince every Ray ſtrikes upon a ſeveral Filament of the Optick Nerve, and all thoſe ſtrings ſo ſtruck are moved equably at the ſame Time. For want of knowing the Nature and Laws of Refraction, which have been exactly ſtated by Modern Mathematicians, the Ancients diſcourſed very lamely of Viſion. This made *Galen* think that the cryſtalline Humour *(f)* was the Seat of Viſion, whoſe only Uſe is to refract the Rays, as the known Experiment of a dark Room, with one only Hole to let in Light, through which a moſt exact Land-skip of every thing without, will be repreſented in its proper Colours, Heights and Diſtances, upon a Paper placed in the Focus of the Convex Glaſs in the Hole, which Experiment is to be found in almoſt every Book of Opticks, does plainly prove. Since the ſame thing will appear, if the cryſtalline

(f) De uſu Partium, lib. VIII. cap. 6.

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ſtalline Humour taken out of an Ox's or a Man's Eye, be placed in the Hole inſtead of the Glaſs. The Way how the watry Humour of the Eye, when by Accident loſt, may be and is conſtantly ſupplied, was firſt found out and deſcribed by Monſieur *Nuck* (*g*), who diſcovered a particular Canal of Water ariſing from the internal Carotidal Artery, which creeping along the Sclerotic Coat of the Eye, perforates the Cornea near the Pupil, and then branching its ſelf curiouſly about the Iris, enters and ſupplies the watry Humour. As to the Veſſels which moiſten the Eye, that it may move freely in its Orbit, the Ancients knew in general that there were Two Glands in the Corners of the Eyes (*h*); but the Lympheducts, through which the Moiſture is conveyed from thoſe Glands were not fully traced till *Steno* (*i*) and *Briggs* (*k*) deſcribed them; ſo that there is juſt the ſame Difference between our Knowledge and the Ancients in this particular, as there is between his Knowledge who is ſure there is ſome Road or other from this Place to that, and his who knows the whole Courſe, and all the Turnings of the Road, and can deſcribe it on a Map.

(g) De Ductibus novis Aquoſis

(h) *Galen* de V. P. lib. X. c. 11.

(i) *Obſervat. Anatomicæ de Oris Oculorum & Narium Vaſis.*

(k) Ophthalmographia.

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The Inſtruments by which Sounds are conveyed from the *Drum* to the *Auditory Nerves* in the inner Cavities of the *Ear*, were very little, if at all, known to the Ancients. In the Firſt Cavity there are Four ſmall Bones, the *Hammer*, the *Anvil*, the *Stirrup*, and a ſmall flattiſh Bone juſt in the Articulation of the *Anvil* and the *Stirrup*. It is now certainly known, that when the Drum is ſtruck upon by the external Air, theſe little Bones, which are as big in an Infant as in adult Perſons, move each other; the Drum moves the Hammer, That the Anvil, That the Stirrup, which opens the oval Entrance into the Second Cavity: None of theſe Bones were ever mentioned by the Ancients, who only talked of Windings and Turnings within the *Os Petroſum*, that were covered by the large Membrane of the Drum. *Jacobus Carpus*, one of the firſt Reſtorers of Anatomy in the laſt Age, found out the *Hammer* and the *Anvil*, *Realdus Columbus* diſcovered the *Stirrup*, and *Franciſcus Sylvius* the little flattiſh Bone, by him called *Os Orbiculare*; but miſtook its Poſition: He thought it had been placed Sideways of the Head of the *Stirrup*, whereas Monſieur *du Verney* (l) finds that it lies in the *Head* of the *Stirrup*, between that and the *Anvil*. The other

(l) Traité del' Organes de l' Ouye. *Paris*, 1683.

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other inner Cavities were not better underſtood, the ſpiral Bones of the *Cochlea*, that are divided into Two diſtinct Cavities, like Two pair of Winding-Stairs parallel to one another, which turn round the ſame Axis, with the Three ſemicircular *Canals* of the *Labyrinthus*, into which the inner Air enters, and ſtrikes upon the ſmall Twigs of the Auditory Nerves inſerted into thoſe ſmall Bones, were things that they knew ſo little of that they had no Names for them; and indeed till Monſieur *du Verney* came, thoſe Mazes were but negligently, at leaſt unſucceſsfully, examined by Moderns as well as Ancients; it being impoſſible ſo much as to form an Idea of what any former Anatomiſts aſſerted of the wonderful Mechaniſm of thoſe little Bones, before he wrote, if we ſet aſide Monſieur *Perrault's (m) Anatomy* of thoſe Parts, which came out a Year or two before; who is not near ſo exact as Monſieur *du Verney*.

(m) Eſſays de Phyſique, Part II.

The other Parts of the Head and Neck, wherein the *Old Anatomy* was the moſt defective, were the *Tongue* as to its internal Texture, and the *Glands of the Mouth, Jaws* and *Throat*. The Texture of the *Tongue* was but gueſſed at, which occaſioned great Diſputes concerning the Nature

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ture of its Subſtance, *(n)* ſome thinking it to be glandulous, ſome muſcular, and ſome of a peculiar Nature, not to be matched in any other part of the Body. This therefore, *Malpighius* examined with his Glaſſes, and diſcovered, that it was cloathed with a double Membrane; that in the inner Membrane there are Abundance of ſmall Papillæ, which have extremities of Nerves inſerted into them, by which the Tongue diſcerns Taſts, and that under that Membrane it is of a muſcular Nature conſiſting of numberleſs Heaps of Fibres which run all manner of Ways over one another like a Mat.

(n) *Vide* Malpighium de Linguâ.

The general Uſes of *the Glands of the Mouth, Jaws* and *Neck* were anciently known; it was viſible that the Mouth was moiſtend by them, and the Maſs of the Spittle ſupplied from them; and then, having named them from the Places near which they lie, as the *Palate*, the *Jaws*, the *Tongue*, the *Ears*, the *Neck*, they went no further; and there was little, if any thing, more done, till Dr. *Wharton*, and *Nicolaus Steno* examined theſe Glands. And upon an exact Enquiry Four ſeveral Salival Ducts have been diſcovered, which from ſeveral Glands diſcharge the Spittle into the Mouth. The Firſt was deſcribed by Dr. *Wharton (o)* near Forty Years ago:

(o) Adenograph. cap. 21.

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ago: it comes from the *conglomerate Glands* that lie close to the inner side of the lower Jaw, and discharges it self near the middle of the Chin into the Mouth. The Second was found out by *Steno (p)* who published his Observations in 1662; this comes from those Glands that lie near the Ears, in the inside of the Cheek, and the outside of the upper-Jaw: The Third was found out *(q)* by *Thomas Bartholin*, who gave an Account of it in 1682, and about the same Time by one *Rivinus* a *German*: It arises from the Glands under the Tongue, and going in a distinct Canal to the Mouth of *Wharton*'s Duct, there, for the most Part, by a common Orifice, opens into the Mouth. The Fourth was discovered by Monsieur *Nuck (r)*; he found a Gland within the Orbit of the Eye, from which, not far from the Mouth of *Steno*'s Duct, Spittle is supplied to the Mouth by a peculiar Canal. Besides these, the same Monsieur *Nuck* found some smaller Glands near the last, but lower down, which by Four distinct Pipes carry some Spittle into the Mouth; so careful has Nature been to provide so many Passages for that necessary and noble Juice, that if some should fail, others might supply their Want.

(p) Observat. Anat. de Oris Vasis.

(q) *Nuck* Sialograp.

(r) Ibid.

CHAP.

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CHAP. XVIII.

Of the Circulation of the Blood.

FRom the *Head*, we are to look into the *Thorax*, and there to consider the *Heart*, and the *Lungs*. The *Lungs*, as most of the other *Viscera*, were believed to be of a *Parenchymous* Substance, till *Malpighius* found by his Glasses (*f*) that they consist of innumerable small Bladders, that open into each other, as far as the outermost; which are covered by the outer Membrane, that incloses the whole Body of the *Lungs*: And that the small Branches of the *Wind-Pipe* are all inserted into these Bladders; about every one of which the *Veins* and *Arteries* are entwined, in an unconceivable Number of Nets and Mazes; that so the inspired Air may press upon, or mix with, the Mass of Blood, in such small Parcels as the Ancients had no Notion of. The *Wind-Pipe* also it self is nourished by an *Artery* that creeps up the Back-side, and accompanies it in all its Branchings: Which was first found out by *Frederic Ruysch*, a *Dutch* Professor of *Anatomy* at *Leyden*, about Thirty Years ago.

(*f*) *Epist. de Pulmonibus.*

But

But the great Diſcovery that has been made of the *Lungs*, is, That the whole Maſs of Blood is carried out of the Right Ventricle of the Heart, by the *Arteria Pulmonaris*, called anciently *Vena Arterioſa*, through all the ſmall Bladders of the *Lungs*, into the *Vena Pulmonaris*, (or *Arteria Venoſa*;) and from thence, into the Left Ventricle of the Heart again. So that the Heart is a ſtrong Pump, which throws the Blood, let in from the Veins, into the Lungs; and from the Lungs, afterwards, into the Arteries; and this by a conſtant rapid Motion, whereby the Blood is driven round in a very few Minutes. This Diſcovery, firſt made perfectly intelligible by Dr. *Harvey*, is of ſo very great Importance to ſhew the Communication of all the Humours of the Body, each with other, that as ſoon as Men were perfectly ſatisfied that it was not to be conteſted, which they were in a few Years, a great many put in for the Prize, unwilling that Dr. *Harvey* ſhould go away with all the Glory. *Vander Linden*, who publiſhed a moſt exact Edition of *Hippocrates*, in *Holland*, about Thirty Years ago, has taken a great deal of Pains to prove that *Hippocrates* knew the *Circulation of the Blood*, and that Dr. *Harvey* only revived it. The Sub-

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Subſtance of what has been ſaid in this Matter, is this; that *Hippocrates* ſpeaks (*t*) in one Place, *of the Uſual and Conſtant Motion of the Blood:* That in another Place, he calls (*u*) *the Veins and Arteries the Fountains of Humane Nature, the Rivers that water the whole Body, that convey Life; and which, if they be dried up, the Man dies:* That in a Third Place, he ſays, (*w*) *That the Blood-Veſſels, which are diſperſed over the whole Body, give Spirit, Moiſture and Motion, and all ſpring from one; which one* (Blood-Veſſel) *has no Beginning, nor no End, that I can find; for, where there is a Circle, there is no Beginning.* Theſe are the cleareſt Paſſages that are produced, to prove, that *Hippocrates* knew the *Circulation of the Blood;* and it is plain from them, that he did believe it as an *Hypotheſis;* that is, in plain *Engliſh*, that he did ſuppoſe the Blood to be carried round the Body by a *conſtant accuſtomed Motion:* But that he did not know what this conſtant accuſtomed Motion was; and that he had not found

(t) Παεαφερείσων ἐν τῇ νόσῳ διὰ παντὸς, ἔτε τῆς αἵματος ἐφαρμένης, τε ἢ ἐπικεκτημένης ἢ εἰωθυίας κίνησιν. De Morbis, lib. 1. §. 30. Edit. Vand.

(u) Αὗται πηγαὶ φύσεως ἀνθρώπου, ἢ οἱ ποταμοὶ ἐνταῦθα εἰσὶ τὸ σῶμα, τοῖσιν δεῖ τὸ σπλὴν· ὅτου ἢ ἢν ξηρανθῇ, ἄνθρωπος ἀποθνήσκει. ἢν αἱμαθήσιν ἀποδαρῇ ὁ ἄνθρωπος, De Corde, §. 5.

(w) Αἱ φλέβες διὰ τῆς σώματος κεχυμέναι, πνεῦμα, ἢ ῥεῦμα ἢ κίνησιν παρέχουσι, ἀπὸ μιῆς πολλαὶ διαβλαστάνουσαι· ἢ αὕτη μὲν ἡ ἀρχή, ὅθεν ἤρξω, ἢ ἡ τετελεύτηκεν, ἐκ οἶδα, κύκλος δὲ γεγωμένης, ἀρχὴ οὐκ εὑρέθη. De Venis, §. 17.

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found that Course which, in our Age, Dr. *Harvey* first clearly demonstrated, will appear evident from the following Considerations: (1.) He says nothing of the *Circulation of the Blood* in his Discourse *of the Heart*, where he Anatomizes it as well as he could; and speaks of (*x*) the Ventricles, and the Valves (*y*), which are the immediate Instruments by which the Work is done. (2.) He believes that the Auricles of the Heart (*z*) are like Bellows, which receive the Air to cool the Heart. Now there are other Uses of them certainly known, since they assist the Heart in the Receiving of the Blood from the *Vena Cava*, and the *Vena Pulmonaris*. This cannot be unknown to any Man that knows how the Blood circulates; and accordingly, would have been mentioned by *Hippocrates*, had he known of it. (3.) *Hippocrates* speaks of Veins (*a*), as receiving Blood *from* the Heart, and going *from* it: Which also was the constant Way of Speaking of *Galen*, and all the Ancients. Now, no Man that can express himself properly, will ever say, That any Liquors are carried away *from* any Cistern, as from a Fountain or Source, through *those* Canals which,

(x) De Corde, §. 4.
(y) Ibid. §. 7, 8.
(z) Ib. §. 6.

(a) *Arteriæ quidem purum sanguinem & spiritum* à corde *recipiunt*; *Venæ autem & ipsæ* à corde *sanguinem sumunt, per quas corpori distribuitur*; De Structura Hominis, §. 2.

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to his Knowledge, convey Liquors to that Ciſtern. (4.) *Hippocrates* ſays, the Blood is carried into the Lungs, from the Heart, for the Nouriſhment of the Lungs; without aſſigning any other Reaſon (*b*). Theſe ſeem to be poſitive Arguments, that *Hippocrates* knew nothing of this Matter; and accordingly, all his Commentators, Ancient and Modern, before Dr. *Harvey*, never interpreted the former Paſſages of the *Circulation of the Blood*: Neither would *Vander Linden*, in all probability, if Dr. *Harvey* had not helped him to the Notion; which he was then reſolved to find in *Hippocrates*, whom he ſuppoſed not the Father only, but the Finiſher alſo of the whole Medical Art. It is pretended to by none of the Ancients, or rather their Admirers for them, after *Hippocrates*. As for *Galen*, any Man that reads what he ſays of the Heart and Lungs, in the 6th. Book of his *De Uſu Partium*, muſt own, that he does not diſcourſe as if he were acquainted with Modern Diſcoveries; and therefore it is not ſo much as pretended that he knew this Recurrent Motion of the Blood. Which alſo further ſhews, that if *Hippocrates* did know it, he explained himſelf ſo obſcurely, that *Galen* could not underſtand him; who, in all probability, underſtood *Hippocrates*'s Text

(b) De Corde, §. 10.

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Text as well as any of his Commentators, who have written ſince the *Greek* Tongue; and much more, ſince the *Ionic* Dialect has ceaſed to be a living Language.

Since the Ancients have no Right to ſo noble a Diſcovery, it may be worth while to enquire, to whom of the Moderns the Glory of it is due; for this is alſo exceedingly conteſted. The firſt Step that was made towards it, was, the finding that the whole Maſs of the Blood paſſes through the Lungs, by the Pulmonary Artery and Vein.

The firſt that I could ever find, who had a diſtinct *Idea* of this Matter, was *Michael Servetus*, a *Spaniſh* Phyſician, who was burnt for *Arianiſm*, at *Geneva*, near 140 Years ago. Well had it been for the *Church of Chriſt*, if he had wholly confined himſelf to his own Profeſſion! His Sagacity in this Particular, before ſo much in the dark, gives us great Reaſon to believe, that the World might then have had juſt Cauſe to have bleſſed his Memory. (c) In a Book of his, intituled, *Chriſtianiſmi Reſtitutio*,

(c) *Vitalis Spiritus in ſiniſtro cordis ventriculo ſuam Originem habet, juvantibus maximè pulmonibus ad ipſius generationem. Eſt ſpiritus tenuis, cujus vi elaboratus, flavo colore, igneâ potentiâ, ut ſit quaſi ex puriore ſanguine lucidus, vapor: generatur ex facta in pulmone mixtione inſpirati aëris cum elaborato ſubtili ſanguine, quem dexter ventriculus ſiniſtro communicat. Fit autem communicatio hæc non per parietem cordis medium ut vulgo creditur, ſed magno artificio à dextro cordis ventriculo, longo per pulmones ductu, agitatur ſanguis ſubtilis; à pulmonibus præparatur; flavus ejicitur, & à venâ arteriosâ in arteriam venoſam transfunditur; deinde in ipsâ arteriâ venosâ inſpirato aëri miſcetur & exſpiratione à fuligine repurgatur; atque ita tandem à ſiniſtro cordis ventriculo totum mixtum per diaſtolen attrahitur, apta ſupellex ut fiat ſpiritus vitalis.* Servet. Chriſtian. Reſtit.

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printed in the Year MDLIII. he clearly asserts, that the Blood passes through the Lungs, from the Left to the Right Ventricle of the Heart; and not through the *Partition* which divides the two Ventricles, as was at that Time commonly believed. How he introduces it, or in which of the Six Discourses, into which *Servetus* divides his Book, it is to be found, I know not, having never seen the Book my self. Mr. *Charles Bernard*, a very learned and eminent Chirurgeon of *London*, who did me the Favour to communicate this Passage to me, (set down at length in the Margin) which was transcribed out of *Servetus*, could inform me no further, only that he had it from a learned Friend of his, who had himself copied it from *Servetus*.

Realdus Columbus, of *Cremona*, was the next that said any thing of it, in his *Anatomy*, printed at *Venice*, 1559. in *Folio*; and at *Paris*, in 1572. in *Octavo*; and afterwards elsewhere. There he asserts the same (*d*) Circulation through the

(d) *Duæ insunt cordi cavitates, h. e. ventriculi duo; ex his alter à dextris est: à sinistris alter; dexter sinistro multò est major; in dextro sanguis adest naturalis, ac vitalis in sinistro: illud autem observatu perpulchrum est, substantiam cordis dextrum ventriculum ambientem tenuem satis esse, sinistram vero crassam; & hoc tum æquilibrii causâ factum est, tum ne sanguis vitalis, qui tenuissimus est, extra resudaret. Inter hos ventriculos septum adest, per quod fere omnes existimant sanguinî à dextro ad sinistrum aditum patefieri; id ut fiat facilius, in transitu ob vitalium spirituum generationem tenuem reddi: sed longâ errant viâ: nam sanguis per arteriosam venam ad pulmonem fertur, ibique attenuatur; deinde cum aëre unà per arteriam venalem ad sinistrum cordis ventriculum defertur; quod nemo hactenus aut animadvertit, aut scriptum reliquit.* Reald. Columb. Anat. lib. vii. p. 325. Edit. Lut.

Lungs,

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Lungs, that *Servetus* had done before; but says, that no Man had ever taken notice of it before him, or had written any Thing about it; Which shews that he did not copy from *Servetus*; unless one should say, that he stole the Notion, without mentioning *Servetus*'s Name; which is injurious, since in these Matters the same Thing may be, and very often is observed by several Persons, who never acquainted each other with their Discoveries. But *Columbus* is much more particular; (e) for he says, That the Veins lodge the whole Mass of the Blood in the *Vena Cava*, which carries it into the Heart, whence it cannot return the same Way that it went; from the Right Ventricle it is thrown into the Lungs by the Pulmonary Artery, where the Valves are so placed as to hinder its Return that Way into the Heart, and so it is thrown into the Left Ventricle, and by the *Aorta* again, when enliven'd by the Air, diffused through the whole Body.

(e) *Idcirco quando dilatatur, sanguinem à cavâ venâ in dextrum ventriculum suscipit, nec non ab arteriâ venosâ sanguinem paratum ut diximus unà cum aëre in sinistrum: propterea membranæ illæ demittuntur & ingressui eedum: nam cum cor coarctatur, hæ claudumtur, ne quod susciperetur per eandem viam retrocedat; eodemque tempore membranæ tum magnæ arteriæ, tum venæ arteriosæ recluduntur, aditumque præbent spirituoso sanguini exeunti, qui per universum corpus funditur, sanguinique naturali ad pulmones delato. Res itaq; semper habet, cum dilatatur, quas prius memoravimus, recluduntur, claudumtur reliquæ; itaque comperies sanguinem qui in dextrum ventriculum ingressus est, non posse in cavam venam retrocedere.* Ibid. pag. 330. Vide quoque lib. xi. pag. 411.

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Some Years after appeared *Andreas Cæsalpinus*, who printed his *Peripatetical Questions* at *Venice*, in *Quarto*, in 1571. And afterwards with his *Medical Questions*, at the same Place, in 1593. He is rather more particular than *Columbus*, especially in examining how Arteries and Veins joyn at their Extremities; which he supposes to be by opening their Mouths into each other: And he uses the Word *Circulation* in his *Peripatetical Questions*, which had never been used in that Sence before. He also takes notice, that the Blood swells below the Ligature in veins, and urges that in Confirmation of his Opinion.

At last, Dr. *William Harvey* printed a Discourse on purpose, upon this Subject, at *Francfort*, in 1628. This Notion had only been occasionally and slightly treated of by *Columbus* and *Cæsalpinus*, who themselves, in all probability, did not know the Consequence of what they asserted; and therefore it was never applied to other Purposes, either to shew the Uses of the other *Viscera*, or to explain the Natures of Diseases: Neither, for any Thing that appears at this Day, had they made any Numbers of Experiments, which were necessary to explain their Doctrine, and to clear it from Opposition.

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position. All this Dr. *Harvey* undertook to do; and with indefatigable Pains, traced the visible Veins and Arteries throughout the Body, in their whole Journey *from* and *to* the Heart; so as to demonstrate, even to the most incredulous, not only that the Blood circulates through the Lungs and Heart, but the very Manner how, and the Time in which that great Work is performed. When he had once proved that the Motion of the Blood was so rapid as we now find it is, then he drew such Consequences from it, as shewed that he throughly understood his Argument, and would leave little, at least, as little as he could, to future Industry to discover in that particular Part of Anatomy. This gave him a just Title to the Honour of so noble a Discovery, since what his Predecessors had said before him was not enough understood, to form just Notions from their Words. One may also observe how gradually this Discovery, as all abstruse Truths of Humane Disquisition, was explained to the World. *Hippocrates* first talked of the *Usual Motion* of the *Blood*. *Plato* said, That the *Heart* was *the Original* of the *Veins*, and of the *Blood*, that was carried about every Member of the Body. *Aristotle* also somewhere speaks of a *Recur-*

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rent Motion of the Blood: Still all this was only *Opinion* and *Belief*: It was rational, and became Men of their Genius's; but, not having as yet been made evident by Experiments, it might as eaſily be denied as affirmed. *Servetus* firſt *ſaw* that the Blood paſſes through the Lungs; *Columbus* went further and ſhew'd the Uſes of the *Valves* or *Trap-doors* of the Heart, which let the Blood *in* and *out* of their Reſpective Veſſels, but not the ſelf ſame Road: Thus the Way was juſt open when Dr. *Harvey* came, who built upon the Firſt Foundations; to make his Work yet the eaſier, the Valves of the Veins which were diſcovered by F. *Paul* the *Venetian*, had not long before been explained by *Fabricius ab Aqua pendente*, whence the Circulation was yet more clearly demonſtrated.

There was one thing ſtill wanting to compleat this Theory, and that was the Knowledge how the Veins received that Blood which the Arteries diſcharged; firſt it was believed that the Mouths of each ſort of Veſſels joined into one another; that Opinion was ſoon laid aſide, becauſe it was found that the capillary Veſſels were ſo extremely ſmall, that it was impoſſible with the naked Eye to trace them. This put them upon imagining

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gining that the Blood ouzes out of the Arteries, and is abſorbed by the Veins, whoſe ſmall Orifices receive it, as it lies in the Fibres of the Muſcles, or in the Parenchyma's of the Bowels: Which Opinion has been generally received by moſt Anatomiſts ſince Dr. *Harvey*'s Time. But Monſieur *Leeuwenhoek* has lately found in ſeveral ſorts of Fiſhes *(f)*, which were more manageable by his Glaſſes than other Animals, That Arteries and Veins are really continued Syphons variouſly wound about each other towards their Extremities in numberleſs Mazes, over all the Body; and others have found *(g)* what he ſays to be very true in a Water Newt. So that this Diſcovery has paſſed unconteſted. And ſince it has been conſtantly found, that Nature follows like Methods in all ſorts of Animals, where ſhe uſes the ſame ſorts of Inſtruments, it will always be believed, That the Blood circulates in Men after the ſame Manner as it does in *Eels*, *Perches*, *Pikes*, *Carps*, *Bats*, and ſome other Creatures, in which Monſieur *Leeuwenhoek* tried it. Though the Ways how it may be viſible to the Eye in Men, have not, that I know of, been yet diſcovered. However this viſible *Circulation of the Blood* in theſe Creatures effectually removes Sir *William Temple*'s Scruple,

(f) Letter 65, 66.

(g) Philoſ. Tranſact. numb. 177.

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Scruple, who seems unwilling to believe the *Circulation of the Blood*, because he could not see it. His Words are these *(h)*: *Nay it is disputed whether* Harvey's Circulation of the Blood *be true or no, for though Reason may seem to favour it more than the contrary Opinion; yet Sense can very hardly allow it, and to satisfie Mankind both these must concurr.* Sense therefore here allows it, and that this *Sense* might the sooner *concurr*, Monsieur *Leeuwenhoek* describes the Method how this Experiment may be tried in his 66*th*. Letter: The Inferences that may be made from this Noble Discovery are obvious, and so I shall not stay to mention them.

(h) 44,45.

CHAP. XIX.

Further Reflections upon Ancient and Modern Anatomy.

IF after this long Enquiry into the First Discovery of the *Circulation of the Blood*, it should be found that *the Anatomy of the Heart* was but slightly known to the Ancients, it will not, I suppose, be a Matter of any great Wonder. The First Opinion which we have of the Texture of the Heart, was that of *Hippocrates* (*i*), that

(i) De Corde, §. 4.

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that it is a very ſtrong Muſcle; this tho' true was rejected afterwards for want of knowing its true Uſe; its internal Diviſions, its Valves, and larger viſible Fibres were well known and diſtinctly deſcribed by the Ancients; only they were miſtaken in thinking that there is a Communication between the Ventricles through the *Septum*, which is now generally known to be an Errour. The Order of the Muſcular Fibres of the Heart was not known before Dr. *Lower*, who diſcovered them to be Spiral like a Snale-Shell, as if ſeveral Skains of Threads of differing Lengths had been wound up into a Bottom of ſuch a Shape, hollow, and divided within. By all theſe Diſcoveries *Alphonſus Borellus* (*k*) was enabled to give ſuch a Solution of all the Appearances of the Motion of the Heart, and of the Blood in the Arteries, upon Mathematical and Mechanical Principles, as will give a more ſatisfactory Account of the wonderful Methods of Nature in diſpenſing Life and Nouriſhment to every Part of the Body, than all that had ever been written upon theſe Subjects before thoſe things were found out.

(k) De Motu Animalium, Part II. cap. 5.

Below the *Midriff* are ſeveral very noble *Viſcera*: *The Stomach, the Liver, the Pancreas or Sweet-Bread, the Spleen, the Reins,*

Reins, the Inteſtines, the Glands of the Meſentery, and the Inſtruments of Generation of both Sexes; in the Anatomical Knowledge of all which Parts, the Ancients were exceedingly defective.

The *Coats of the Stomach* have been ſeparated, and the ſeveral Fibres of the middle Coat examined by Dr. *Willis (l)* with more Exactneſs than formerly; he alſo has been very nice in tracing the Blood-Veſſels and Nerves that run amongſt the Coats, has evidently ſhewn that its Inſide is covered with a glandulous Coat, whoſe Glands ſeparate that Mucilage; which both preſerves the Fibres from being injured by the Aliments which the Stomach receives, and concurrs with the Spittle to further the Digeſtion there performed; and has given a very particular Account of all thoſe ſeveral Rows of Fibres, which compoſe the muſculous Coat: To which if we add *Steno*'s Diſcovery of the Fibres of the muſculous Coat of the Gullet, that they are ſpiral in a double Order, one aſcending, the other deſcending, which run contrary Courſes, and mutually croſs each other in every Winding; with Dr. *Cole*'s *(m)* Diſcovery of the Nature of the Fibres of the Inteſtines, that they alſo move ſpirally, though not, perhaps, in a contrary Order,

(l) Pharmaceut. Rational.

(m) Philoſ. Tranſ. numb. 125.

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der, from the beginning of the *Duodenum* to the end of the ſtreight Gut, the Anatomy of thoſe parts ſeems to be almoſt compleat.

The great Uſe of *the Stomach* and *the Guts*, is to prepare the Chyle, and then to tranſmit it through the Glands of the Meſentery into the Blood; this the Ancients knew very well; the Manner how it was done they knew not. *Galen (n)* held that the Meſaraick Veins, as alſo thoſe which go from the Stomach to the Liver, carry the Chyle thither, which by the Warmth of the Liver is put into a Heat, whereby the Fæculencies are ſeparated from the more ſpirituous Parts, and by their Weight ſink to the Bottom; the purer Parts go into the *Vena Cava*. The Dregs which are of two ſorts, *Choler* and *Melancholy*, go into ſeveral Receptacles; the Choler is lodged in the Gall-Bladder and *Porus Bilarius*: Melancholy is carried off by the Spleen. The Original of all theſe Notions was Ignorance of the Anatomy of all theſe Parts, as alſo of the conſtant Motion of the Blood through the Lungs and Heart. *Herophilus*, who is commended as the ableſt Anatomiſt of Antiquity, found out (*o*) that there were Veins diſperſed quite through the Meſentery, as far as the ſmall Guts reach, which carried

(n) De Uſu Partium, lib. 4. cap. 2, 3, 4, 5.

(o) De U. P. lib. 4. c. 19.

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carried the Chyle from the Inteſtines into ſeveral *Glandulous Bodies*, and there lodged them. Theſe are the *Milky Veins* again diſcovered by *Aſellius* about Fifty Years ago, and thoſe Glands which *Herophilus* ſpoke of, are probably that great Collection of Glands in the Meſentery that is commonly called the *Pancreas Aſellii*. After *Herophilus* none of the Ancients had the Luck to trace the Motions of the Chyle any further, and ſo theſe milky Veins were confounded with the Meſaraicks, and it was commonly believed, That becauſe all Meſaraicks carry the Blood from the Inteſtines into the Liver, therefore they carried Chyle alſo when there was any Chyle to carry; and hence probably it was that the Liver was believed to be the common Work-Houſe of the Blood. But when *Aſellius* had traced the Chyle as far as the great Gland of the Meſentery, it was ſoon found not to lie there. And *Pecquet*, about Forty Years ſince, diſcovered the *common Receptacle of the Chyle*, whither it is all brought. Thence he alſo found that it is carried, by particular Veſſels through the Thorax, almoſt as high as the Left-Shoulder, and there thrown into the Left Subclavian Vein, and ſo directly carried to the Heart. It has alſo been diſcovered that in his Canal,

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uſually called *Ductus Thoracicus*, there are numerous Valves, which hinder the Return of the Chyle to the common Receptacle, ſo that it can be moved forwards, but not backwards.

Since this Paſſage of the Chyle has been diſcovered, it has been by ſome believed, that the *Milk* is conveyed into the Breaſts, by little Veſſels, from the *Ductus Thoracicus*. The whole Oeconomy of that Affair has been particularly deſcribed very lately by Mr. *Nuck*; before whoſe Time it was but imperfectly known. He ſays therefore, that the Breaſts are Heaps of Glands, ſupplied with Blood by innumerable Ramifications of the Axillary and Thoracick Arteries; ſome of which paſſing through the Breaſt-bone, unite with the Veſſels of the oppoſite Side. Theſe Arteries, which are unconceivably ſmall, part with the Milk in thoſe ſmall Glands, into ſmall Pipes, four or five of which meeting together, make one ſmall Trunk; of theſe ſmall Trunks, the large Pipes, which terminate in the Nipple, are made up; though before they arrive thither, they ſtraiten into ſo ſmall a Compaſs, that a ſtiff Hair will juſt paſs through. The Nipple, which is a Fibrous Body, has ſeven or eight, or more Holes, through which every Pipe emits its Milk upon Suction;

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Suction; and, leſt any one of them being ſtopped, the Milk ſhould ſtagnate, they all have croſs Paſſages into each other, at the Bottom of the Nipple, where it joyns to the Breaſt.

The fore-mentioned Diſcovery of the Paſſage of the Chyle obliged Men to re-examine the Notions which, till then, had generally obtained, concerning the Nature and Uſes of the *Liver*. Hitherto it had been generally believed, that the Blood was made there, and ſo diſperſed into ſeveral Parts, for the Uſes of the Body, by the *Vena Cava*. *Eraſiſtratus*, indeed, ſuppoſed (*p*) that its principal Uſe was, to ſeparate the Bile, and to lodge it in its proper Veſſels: But, for want of further Light, his Notion could not then be ſufficiently proved; and ſo it preſently fell, and was never revived, till *Aſellius*'s and *Pecquet*'s Diſcoveries put it out of doubt. Till *Malpighius* diſcovered its Texture by his Glaſſes, its Nature was very obſcure. But he has found out, (1.) That the Subſtance of the Liver is framed of innumerable Lobules, which are very often of a Cubical Figure, and conſiſt of ſeveral little Glands, like the Stones of Raiſins; ſo that they look like Bunches of Grapes, and are each of them cloathed with a diſtinct Membrane.

(p) Galen de U. P. lib. 4. cap. 13.

(2.) That

(2.) That the whole Bulk of the Liver consists of these Grape-stone-like Glands, and of divers sorts of Vessels. (3.) That the small Branches of the *Cava*, *Porta*, and *Porus Bilarius*, run through all, even the least of these Lobules, in an equal Number; and that the Branches of the *Porta* are as Arteries that convey the Blood *to*, and the Branches of the *Cava* are the Veins which carry the Blood *from* all these little Grape-stone-like Glands. From whence it is plain, that the Liver is a Glandulous Body, with its proper Excretory Vessels, which carry away the Gall that lay before in the Mass of the Blood.

Near the Liver lies the *Pancreas*, which *Galen* believed *(q)* to be a Pillow to support the Divisions of the Veins, as they go out of the Liver; and, for what appears at present, the Ancients do not seem to have concerned themselves any further about it. Since, it has been found to be a Glandulous Body, wherein a distinct Juice is separated from the Blood; which, by a peculiar Canal, first discovered by *Georgius Wirtsungus*, a *Paduan* Physician, is carried into the *Duodenum*; where meeting with the Bile, and the Aliment just thrown out of the Stomach, assists and promotes the Business of Digestion.

(q) De U. P. lib. 5. cap. 2.

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The *Spleen* was as little underſtood as the *Pancreas*; and for the ſame Reaſons: Its Anatomy was unknown, and its Bulk made it very remarkable; ſomething therefore was to be ſaid about it: And what no Body could poſitively diſ-prove, might the eaſier be either received or contradicted. The moſt general Opinion was, that the groſſer Excrements of the Chyle and Blood were carried off from the Liver, by the *Ramus Splenicus*, and lodged in the Spleen, as in a common Ciſtern: But ſince the *Circulation of the Blood* has been known, it has been found, that the Blood can go from the Spleen to the Liver, but that nothing can return back again into the Spleen. And as for its Texture, (*r*) *Malpighius* has diſcovered, that the Subſtance of the Spleen, deducting the numerous Blood-Veſſels and Nerves, as alſo the Fibres which ariſe from its Second Membrane, and which ſupport the other Parts, is made up of innumerable little Cells, like Honey-Combs, in which there are vaſt Numbers of ſmall Glandules, which reſemble Bunches of Grapes; and that theſe hang upon the Fibres, and are fed by Twigs of Arteries and Nerves, and ſend forth the Blood there purged, into the *Ramus Splenicus*, which carries it into the Liver; to

(r) De Liene.

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to what purpoſe, not yet certainly diſcovered.

The Uſe of the *Reins* is ſo very conſpicuous, that, from *Hippocrates*'s Time, downwards, no Man ever miſtook it: But the Mechaniſm of thoſe wonderful Strainers was wholly unknown, till the ſo often mentioned *Malpighius* (ſ) found it out. He therefore, by his Glaſſes, diſcovered, that the Kidneys are not one uniform Subſtance, but conſiſt of ſeveral ſmall Globules, which are all like ſo many ſeveral Kidneys, bound about with one common Membrane; and that every Globule has ſmall Twigs from the emulgent Arteries, that carry Blood to it; Glands, in which the Urine is ſtrained from it; Veins, by which the purified Blood is carried off to the Emulgent Veins, thence to go into the *Cava*; a Pipe, to convey the Urine into the great Baſin in the middle of the Kidney; and a Nipple, towards which ſeveral of thoſe ſmall Pipes tend, and through which the Urine ouzes out of them, into the Baſin. This clear Uſe of the Structure of the Reins, has effectually confuted ſeveral Notions that Men had entertained, of ſome Secundary Uſes of thoſe Parts; ſince hereby it appears, that every Part of the Kidneys is immediately, and

(ſ) De Renibus.

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wholly ſubſervient to that ſingle Uſe, of Freeing the Blood from its ſuperfluous *Serum*.

What has been done by Modern *Anatomiſts*, towards the Compleating of the Knowledge of the remaining Parts, I ſhall omit. That the Ancients likewiſe took Pains about them, is evident from the Writings of *Hippocrates*, *Ariſtotle* and *Galen*. The Diſcoveries which have ſince been made are ſo great, that they are, in a manner, undiſputed: And the Books which treat of them are ſo well known, that it will not be ſuſpected that I decline to enlarge upon them, out of a Dread of giving up more to the Ancients in this Particular, than I have done all along.

The Diſcoveries hitherto mentioned, have been of thoſe Parts or Humours of the Body, whoſe Exiſtence was well enough known to the Ancients. But, beſides them, other Humours, with Veſſels to ſeparate, contain, and carry them to ſeveral Parts of the Body, have been taken notice of; of which, in ſtrictneſs, the Ancients cannot be ſaid to have any ſort of Knowledge. Theſe are, the *Lympha*, or Colourleſs Juice, which is carried to the Chyle and Blood, from ſeparate Parts of the Body: And the *Mucilage*

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lage of the Joints, which lubricates them, and the Muſcles, in their Motions. The Diſcovery of the *Lympha*, which was made about Forty Years ago, is contended for by ſeveral Perſons. *Thomas Bartholine*, a *Dane*, and *Olaus Rudbeck*, a *Suede*, publiſhed their Obſervations about the ſame Time: And Dr. *Jolliffe*, an *Engliſh-Man*, ſhewed the ſame to ſeveral of his Friends, but without publiſhing any Thing concerning them. The Diſcoveries being undoubted, and all Three working upon the ſame Materials, there ſeems no Reaſon to deny any of them the Glory of their Inventions. The Thing which they found was, that there are innumerable ſmall, clear Veſſels in many Parts of the Body, chiefly in the Lower Belly, which convey a Colourleſs Juice, either into the common Receptacle of the Chyle, or elſe into the Veins, there to mix with the Blood. The *Valves* which *Frederic Ruyſch* found and demonſtrated in them, about the ſame Time, manifeſtly ſhewed, that this is its Road; becauſe they prove, that the *Lympha* can go forwards from the Liver, Spleen, Lungs, Glands of the Loins and Neck, or any other Place, whence they ariſe, towards ſome Chyliferous Duct, or Vein; but cannot go back from thoſe Chyliferous

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Ducts, or Veins, to the Place of their Origination. What this Origination is, was long uncertain, it not being eaſie to trace the ſeveral Canals up to their ſeveral Sources. *Steno* (*t*) and *Malpighius* (*u*) did, with infinite Labour, find, that Abundance of Lympheducts paſſed through thoſe numerous *Conglobate Glands* that are diſperſed in the *Abdomen* and *Thorax*; which made them think that the Arterious Blood was there purged of its *Lympha*, that was from thence carried off into its proper Place, by a Veſſel of its own. But Mr. *Nuck* has ſince (*w*) found, that the Lympheducts ariſe immediately from Arteries themſelves; and that many of them are percolated through thoſe *Conglobate Glands*, in their Way to the Receptacle of the Chyle, or thoſe Veins which receive them. By theſe, and innumerable other Obſervations, the Uſes of the Glands of the Body have been found out; all agreeing in this one Thing, namely, that they ſeparate the ſeveral Juices that are diſcernable in the Body, from the Maſs of the Blood wherein they lay before. From their Texture they have of late been divided into *Conglomerate*, and *Conglobate*. The *Conglomerate Glands* conſiſt of many ſmaller Glands, which lie near one another, covered

(t) Obſervat. Anatom.

(u) Epiſt. de Glandul. Conglobat.

(w) Adenograph.

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covered with one common Membrane, with one or more common Canals, into which the ſeparated Juice is poured by little Pipes, coming from every ſmaller Glandule; as in the Liver, the Kidneys, the Pancreas, and Salival Glands of the Mouth. The *Conglobate Glands* are ſingle, often without an Excretory Duct of their own, only perforated by the Lympheducts. Of all which Things, as eſſential to the Nature of Glands, the Ancient Anatomiſts had no ſort of Notion.

The Mucilage of the Joints and Muſcles was found out by Dr. *Havers* (*x*). He diſcovered in every Joint, particular Glands, out of which iſſues a Mucilaginous Subſtance, whoſe Nature he examined by numerous Experiments; which, with the Marrow ſupplied by the Bones, always ſerves to oil the Wheels, that ſo our Joints and Muſcles might anſwer thoſe Ends of Motion, for which Nature deſigned them. This was a very uſeful Diſcovery, ſince it makes Abundance of Things that were very obſcure in that Part of Anatomy, very plain, and facile to be underſtood: And, among other Things, it ſhews the Uſe of that excellent Oil which is contained in our Bones, and there ſeparated by proper Strainers,

(x) Osteolog.

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from the Mass of the Blood; especially, since, by a nice Examination of the true inward Texture of all the Bones and Cartilages of the Body, he shew'd how this Oil is communicated to the Mucilage, and so united as to perform their Office. And if one compares what Dr. *Havers* says of Bones and Cartilages, with what had been said concerning them before him, his Observations about their Frame may well be added to some of the noblest of all the former Discoveries.

These are some of the most remarkable Instances, how far the Knowledge of the Frame of our Bodies has been carried in our Age. Several Observations may be made concerning them, which will be of Use to the present Question. (1.) It is evident, that only the most visible Things were anciently known; such only as might be discovered without great Nicety. Muscles and Bones are easily separable; their Length is soon traced, and their Origination easily known. The same may be truly said of large Blood-Vessels, and Nerves: But when they come to be exquisitely sub-divided, when their Smalness will not suffer the Eye, much less the Hand, to follow them, then the Ancients were constantly at a Loss: For which Reason, they under-

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ſtood none of the *Viſcera*, to any tolerable Degree. (2.) One may perceive that every new Diſcovery ſtrengthens what went before; otherwiſe the World would ſoon have heard of it, and the erroneous Theories of ſuch Pretenders to new Things would have been exploded and forgotten, unleſs by here and there a curious Man, that pleaſes himſelf with reading Obſolete Books. *Nullius in verba* is not only the Motto of the *ROYAL SOCIETY*, but a received Principle among all the Philoſophers of the preſent Age: And therefore, when once any new Diſcoveries have been examined, and received, we have more Reaſon to acquieſce in them, than there was formerly. This is evident in the *Circulation of the Blood*: Several Veins and Arteries have been found, at leaſt, more exactly traced, ſince, than they were in Dr. *Harvey*'s Time. Not one of theſe Diſcoveries has ever ſhown a ſingle Inſtance of any Artery going *to*, or of any Vein coming *from* the Heart. Ligatures have been made of infinite Numbers of Veſſels; and the Courſe of all the Animal Juices, in all manner of living Creatures, has thereby been made viſible to the naked Eye; and yet not one of theſe has ever weakned Dr. *Harvey*'s Doctrine. The Pleaſure

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ſure of Deſtroying in Matters of this Kind, is not much leſs than the Pleaſure of Building. And therefore, when we ſee that thoſe Books which have been written againſt ſome of the eminenteſt of theſe Diſcoveries, though but a few Years ago, comparatively ſpeaking, are ſo far dead, that it is already become a Piece of Learning even to know their Titles, we have ſufficient Aſſurance that theſe Diſcoverers, whoſe Writings outlive Oppoſition, neither deceive themſelves, nor others. So that, whatſoever it might be formerly, yet in this Age general Conſent in Phyſiological Matters, eſpecially after a long Canvaſs of the Things conſented to, is an almoſt infallible Sign of Truth. (3.) The more Ways are made uſe of to arrive at any one particular Part of Knowledge, the ſurer that Knowledge is, when it appears that theſe different Methods lend Help each to other. If *Malpighius*'s, or *Leeuwenhoek*'s Glaſſes had made ſuch Diſcoveries as Men's Reaſon could not have agreed to, if Objects had appeared confuſed and diſorderly in their Microſcopes, if their Obſervations had contradicted what the naked Eye reveals, then their Verdict had been little worth. But when the Diſcoveries made by the Knife and the

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the Microſcope diſagree only as Twi-light and Noon-day, then a Man is ſatisfied that the Knowledge which each affords to us, differs only in Degree, not in Sort. (4.) It can ſignifie nothing in the preſent Controverſie, to pretend that Books are loſt; or to ſay, that, for ought we know, *Herophilus* might anciently have made this Diſcovery, or *Eraſiſtratus* that; their Reaſonings demonſtrate the Extent of their Knowledge as convincingly as if we had a Thouſand old Syſtems of Ancient Anatomy extant. (5.) In judging of Modern Diſcoveries, one is nicely to diſtinguiſh between *Hypotheſis* and *Theory*. The Anatomy of the Nerves holds good, whether the Nerves carry a Nutritious Juice to the ſeveral Parts of the Body, or no. The *Pancreas* ſends a Juice into the *Duodenum*, which mixes there with the Bile, let the Nature of that Juice be what it will. Yet here a nice Judge may obſerve, that every Diſcovery has mended the Hypotheſes of the Modern Anatomiſts; and ſo it will always do, till the Theories of every Part, and every Juice, be as entire as Experiments and Obſervations can make them.

As theſe Diſcoveries have made the Frame of our own Bodies a much more intelligible Thing than it was before, though

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though there is yet a great deal unknown; ſo the ſame Diſcoveries having been applied to, and found in almoſt all ſorts of known Animals, have made the Anatomy of Brutes, Birds, Fiſhes and Inſects much more perfect than it could poſſibly be in former Ages. Moſt of the Rules which *Galen* lays down in his *Anatomical Adminiſtrations*, are, concerning the Diſſection of Apes. If he had been now to write, beſides thoſe tedious Advices how to part the Muſcles from the Membranes, and to obſerve their ſeveral Inſertions and Originations, the Jointings of the Bones, and the like, he would have taught the World how to make Ligatures of all ſorts of Veſſels, in their proper Places; what Liquors had been moſt convenient to make Injections with, thereby to diſcern the Courſes of Veins, Arteries, Chyle-Veſſels, or Lympheducts; how to unravel the Teſticles; how to uſe Microſcopes to the beſt Advantage: He would have taught his Diſciples when and where to look for ſuch and ſuch Veſſels or Glands; where Chymical Trials were uſeful; and what the Proceſſes were, by which he made his Experiments, or found out his Theories: Which Things fill up every Page in the Writings of later Diſſectors. This he would have done, as well as what

what he did, had theſe Ways of making Anatomical Diſcoveries been then known and practiſed. The World might then have expected ſuch Anatomies of Brutes, as Dr. *Tyſon* has given of the *Rattle-Snake*; or Dr. *Moulin*, of the *Elephant*: Such Diſſections of Fiſhes as Dr. *Tyſon*'s of the *Porpeſſe*; and *Steno*'s, of the *Shark*: Such of Inſects as *Malpighius*'s of a *Silk-Worm*; *Swammerdam*'s, of the *Ephemeron*; Dr. *Liſter*'s, of a *Snail*; and the ſame Dr. *Tyſon*'s, of *Long and Round Body-Worms*. All which ſhew Skill and Induſtry, not conceivable by a Man that is not a little verſed in theſe Matters.

To this Anatomy of Bodies that have Senſitive Life, we ought to add the *Anatomy of Vegetables*, begun and brought to great Perfection in *Italy* and *England* at the ſame Time, by *Malpighius* and Dr. *Grew*. By their Glaſſes they have been able to give an Account of the different Textures of all the Parts of Trees, Shrubs and Herbs; to trace the ſeveral Veſſels which carry Air, Lympha, Milk, Roſin and Turpentine, in thoſe Plants which afford them; to deſcribe the whole Proceſs of Vegetation, from Seed to Seed; and, in a Word, though they have left a great deal to be admired, becauſe it was

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to them incomprehenſible; yet they have diſcovered a great deal to be admired, becauſe of its being known by their Means.

CHAP. XX.

Of Ancient and Modern Natural Hiſtories of Elementary Bodies and Minerals.

HAving now finiſhed my Compariſon of *Ancient and Modern Anatomy*, with as much Exactneſs as my little Inſight into theſe Things would give me Leave, I am ſenſible that moſt Men will think that I have been too tedious. But, beſides that I had not any where found it carefully done to my Hands, (though it is probable that it has in Books which have eſcaped my Notice) I thought that it would be a very effectual Inſtance, how little the Ancients may have been preſumed to have perfected any one Part of Natural Knowledge, when their own Bodies, which they carried about with them, and which, of any Thing, they were the nearlieſt concerned to know, were,

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were, comparatively ſpeaking, ſo very imperfectly traced. However, in the remaining Parts of my Parallel, I ſhall be much ſhorter; which, I hope, may be ſome Amends for my too great Length in this.

From thoſe *Inſtruments*, or *Mechanical Arts*, whether Ancient or Modern, by which *Knowledge* has been advanced, I am now to go to the *Knowledge* it ſelf. According to the Method already propoſed, I am to begin with *Natural Hiſtory* in its uſual Acceptation, as it takes in the *Knowledge* of the ſeveral Kinds of *Elementary Bodies*, *Minerals*, *Inſects*, *Plants*, *Beaſts*, *Birds* and *Fiſhes*. The Uſefulneſs, and the Pleaſure of this Part of Learning is too well known to need any Proof. And beſides, it is a Study, about which the greateſt Men of all Ages have employed themſelves. Of the very few loſt Books that are mentioned in the *Old Teſtament*, one was an *Hiſtory of Plants*, written by the wiſeſt of Men, and he a King. So that there is Reaſon to believe, that it was cultivated with Abundance of Care by all thoſe who did not place the Perfection of Knowledge in the Art of Wrangling about Queſtions, which were either uſeleſs, or which could not eaſily be decided.

Before

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Before I enter into Particulars, it is neceſſary to enquire what are the greateſt Excellencies of a compleat Hiſtory of any one ſort of Natural Bodies. This may ſoon be determined. That Hiſtory of any Body is certainly the beſt, which, by a full and clear Deſcription, lays down all the Characteriſtical Marks of the Body then to be deſcribed; ſo as that its Specifical Idea may be perfectly formed, and it ſelf certainly and eaſily diſtinguiſhed from any other Body, though, at firſt View, it be never ſo like it; which enumerates all its known Qualities; which ſhews whether there are any more beſides thoſe already obſerved; and, laſt of all, which enquires into the ſeveral Ways whereby that Body may be beneficial or hurtful to Man, or any other Body; by giving a particular Account of the ſeveral *Phænomena* which appear upon its Application to, or Combination with other Bodies, of like, or unlike Natures. All this is plainly neceſſary, if a Man would write a full Hiſtory of any ſingle Species of Animals, Plants, Inſects, or Minerals, whatſoever. Or, if he would draw up a General Hiſtory of any one of theſe *Univerſal Sorts*, then he ought to examine wherein every Species of this *Univerſal Sort* agrees each with other; or wherein they

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they are discriminated from any other *Universal Sort* of Things: Thus, by degrees, descend to Particulars, and range every Species, not manifestly Anomalus, under its own Family, or Tribe; thereby to help the Memory of Learners, and assist the Contemplations of those who, with Satisfaction to themselves and others, would Philosophize upon this amazing Variety of Things.

By this Test the Comparison may be made. I shall begin with the simplest Bodies first; which, as they are the commonest, so, one would think, should have been long ago examined with the strictest Care. By these I mean, *Air*, *Water*, *Earth*, *Fire*; commonly called *Elements*. The Three first are certainly distinct and real Bodies, endued with proper and peculiar Qualities; and so come under the present Question.

Of the *History of Air* the Ancients seemed to know little more than just what might be collected from the Observation of its most obvious Qualities. Its Necessity for the immediate Subsistence of Life, and the unspeakable Force of Rapid Winds, or Air forcibly driven all one Way, made it be sufficiently observed by all the World; whilst its Internal Texture, and very few of its remoter

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Qualities, were ſcarce ſo much as dreamt of by all the Philoſophers of Antiquity. Its Weight only was known to *Ariſtotle* (y), (or the Author of the Book *de Cælo*) who obſerved, that a full Bladder out-weighed an empty one. Yet this was carried no further by any of the Ancients, that we know of; diſ-believed by his own School, who ſeemed not to have attended to his Word; oppoſed and ridiculed when again revived, and demonſtrably proved, by the Philoſophers of the preſent Age. All which are Evidences, that anciently it was little examined into, ſince they wanted Proofs to evince that, which Ignorance only made diſputable. But this has been ſpoken to already; I ſhall therefore only add, that, beſides what Mr. *Boyle* has written concerning the Air, one may conſult *Otto Guerick*'s *Magdebourg-Experiments*, the *Experiments of the Academy del Cimento*, *Sturmius*'s *Collegium Curioſum*, Mr. *Halley*'s *Diſcourſes concerning Gravity*, and the *Phænomena of the Baroſcope* in the *Philoſophical Tranſactions* (z). From all which one may find, not only how little of the Nature of the Air was anciently known; but alſo, that there is ſcarce any one Body, whoſe Theory is now ſo near being compleated, as is that of the Air.

(y) De Cœlo, l. 4. c. 4.

(z) Num. 179, & 181.

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The *Natural Hiſtory of Earth and Water* come under that of *Minerals*: *Fire*, as it appears to our Senſes, ſeems to be a Quality, rather than a Subſtance; and to conſiſt in its own Nature, in a Rapid Agitation of Bodies, put into a quick Motion; and divided by this Motion, into very ſmall Parts. After this had been once aſſerted by the *Corpuſcularian* Philoſophers, it was exceedingly ſtrengthned by many Experimental Writers, who have taken abundance of Pains to ſtate the whole *Doctrine of Qualities* clearly, and intelligibly; that ſo Men might know the difference between the Exiſtence or Eſſential Nature of a Body, and its being repreſented to our Senſes under ſuch or ſuch an Idea. This is the Natural Conſequence of proceeding upon clear and intelligible Principles; and reſolving to admit nothing as concluſive, which cannot be manifeſtly conceived, and evidently diſtinguiſhed from every Thing elſe. Here, if in any Thing, the old Philoſophers were egregiouſly defective: What has been done ſince, will appear by conſulting, among others, the Diſcourſes which Mr. *Boyle* has written upon moſt of the conſiderable Qualities of Bodies, which come under our Notice; ſuch as his *Hiſtories of Fluidity and*

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Firmneſs, of Colours, of Cold, his *Origin of Forms and Qualities, Experiments about the Mechanical Production of divers particular Qualities,* and ſeveral others, which come under this Head; becauſe they are not Notions framed only in a Cloſet, by the help of a lively Fancy; but Genuine Hiſtories of the *Phænomena* of Natural Bodies; which appeared in vaſt Numbers, after ſuch Trials were made upon them, as were proper to diſcover their ſeveral Natures.

And therefore, that it may not be thought that I miſtake every plauſible Notion of a witty Philoſopher for a new Diſcovery of Nature, I muſt deſire that my former Diſtinction between *Hypotheſes* and *Theories* may be remembred. I do not here reckon the ſeveral *Hypotheſes* of *Des Cartes, Gaſſendi,* or *Hobbes,* as Acquiſitions to real Knowledge, ſince they may only be Chimæra's and amuſing Notions, fit to entertain working Heads. I only alledge ſuch Doctrines as are raiſed upon faithful Experiments, and nice Obſervations; and ſuch Conſequences as are the immediate Reſults of, and manifeſt Corollaries drawn from, theſe Experiments and Obſervations: Which is what is commonly meant by *Theories.* But of this more hereafter.

That

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That the *Natural Hiſtory of Minerals* was anciently very imperfect, is evident from what has been ſaid of *Chymiſtry* already; to which, all the Advances that have ever been made in that Art, unleſs when Experiments have been tried upon *Vegetable* or *Animal Subſtances*, are properly to be referred. I take *Minerals* here in the largeſt Sence; for all ſorts of *Earths*, *Sulphurs*, *Salts*, *Stones*, *Metals*, and *Minerals* properly ſo called. For Chymiſtry is not only circumſtantially uſeful, but eſſentially neceſſary here; ſince a great many Minerals of very differing Natures would never have been known to have belonged to ſeveral Families, if they had not been examined in the Furnaces of the Chymiſts. But I think this is ſo clear, that I ſhould loſe Time if I ſhould ſay any Thing more about it; and therefore I ſhall rather mention ſome other Things, wherein Diſcoveries have been made in and by Mineral Bodies, without the help of Chymiſtry. The greateſt of which is, of a Stone which the Ancients admired (a), without ever examining to what Uſes it might be applied; and that is, *the Magnet*: The nobleſt Properties whereof Sir *William Temple* acknowledges

(a) *Their Opinions are collected by* Gaſſendi, *in his* Animadverſions upon *Laertius*'s Life of *Epicurus*, p. 362, 363.

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(b) Pag. 48.

ledges to be anciently unknown *(b)*; which is more, indeed, than what ſome do *(c)*, who, at the ſame Time, make our Fore-fathers to have been extreamly ſtupid, that could ſuffer ſuch a Diſcovery to be ever loſt. So that all that can be ſaid of the Advances which, by the Uſes of the *Load-ſtone*, have been made in ſeveral Parts of Learning, do not in the leaſt affect Sir *William Temple*. However, I ſhall mention ſome of the greateſt, becauſe he charges the Moderns with not making all the Uſes of ſo noble an Invention; which he ſuppoſes the Ancient *Greeks* and *Romans* would have made, had it fallen into their Hands: Which makes him aſſert, that the Diſcoveries hereby made in remote Countries have been rather purſued to accumulate Wealth *(d)*, than to increaſe Knowledge. Now, if both theſe can be done at once, there is no Harm done: And ſince there is no Diſpute of the one, I think it will be an eaſie Matter to prove the other. I ſhall name but a few Particulars, moſt of them rather belonging to another Head.

(c) *This they have collected from a Paſſage in* Plautus, Merc. Act. 5. Sc. 2. Hic Secundus Ventus nunc eſt, cape modo vorſoriam; *where by* vorſoria *they underſtand the* Compaſs, *becauſe the Needle always points towards the North: Whereas* vorſoria *is nothing but that Rope with which the Mariners turned their Sails.*

(n) Pag. 49.

Geography therefore was anciently a very imperfect Study, for want of this Knowledge

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Knowledge of the Properties of the *Loadſtone*. The Figure of the Earth could formerly only be gueſſed at; which Sir *William Temple*'s admired *Epicurus* (e) did, for that Reaſon, deny to be round; wherein he ſeems to have been more reaſonable, than in many other of his Aſſertions; becauſe he thought it an Affront to the Underſtanding of Man, to be determined by bare Conjectures, in a Matter which could no other Way be decided. Whereas now, moſt Parts of the Ocean being made eaſily acceſſible, the Latitudes, and reſpective Bearings of every Place are commonly known: The Nature and Appearances of Winds and Tides are become familiar, and have been nicely examined by Intelligent Men in all Parts of the World: The Influence of the Moon, joyned with the Motion of the Earth, have been taken in upon almoſt infallible Grounds, to found Theories of the Sea's Motion upon. And there are great Numbers of other noble, pleaſant and uſeful Propoſitions in *Geography*, *Aſtronomy* and *Navigation*, which ultimately owe their Original to the Diſcovery of that ſingle Quality of this wonderful Stone, *that it always points towards the North*. If theſe Sciences have brought to us the Wealth of the *Indies*, if they

(e) *Vide Gaſſendi*'s Animadverſions upon *Laërtius*'s *Epicurus*, pag. 672.

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have enlarged the Commerce and Intercourſe of Mankind, it is ſo far from being a Diſparagement to the Induſtry of the Moderns, who have cultivated them to ſuch uſeful Purpoſes, that it is the higheſt Character that could be given of thoſe Men, that they purſued their Inventions to ſuch noble Ends. Knowledge not reduced to Practice, when that is poſſible, is ſo far imperfect, that it loſes its principal Uſe. And it is not for acquiring Wealth, but for miſ-employing it when he has acquired it, that a Man ought to be blamed.

Now, to compleat what I have to ſay of *Geography* all at once, I ſhall take notice, that as the Improvements by Navigation have made all the Sea-Coaſts of the Univerſe acceſſible, ſo the Art of Engraving upon Copper-Plates has made it eaſie for Men to draw ſuch Draughts of every particular Coaſt, as will imprint laſting and juſt Idea's of all the Parts of the known World. For want of this, the Ancient Deſcriptions even of thoſe Countries which they knew, were rude, and imperfect: Their Maps were neither exact, nor beautiful: The Longitudes and Latitudes of Places, were very little, if at all, conſidered; the latter of which can now be exactly determined, and the former

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former may be very nearly adjuſted, ſince the Application of Teleſcopes to Aſtronomical Uſes has enabled Men to make much nicer Obſervations of the Moon's Eclipſes than could formerly be made; beſides thoſe of *Jupiter*'s Satellites, to which the Ancients were entirely Strangers. This makes our Maps wonderfully exact; which are not only the Divertiſements of the Curious, but of unſpeakable Uſe in Civil Life, at Sea eſpecially; where, by the help of Sea-Charts, Sailers know where they are, what Rocks lie near them, what Sands they muſt avoid; and can as perfectly tell which Way they muſt ſteer to any Port of the Univerſe, as a Traveller can, upon *Salisbury-Plain*, or *New-Market-Heath*, which Way he muſt ride to a great Town, which he knows before-hand is not far from the Edge of the Plain, or of the Heath. *Velſerus* has printed ſome ancient Maps *(f)*, that were made for the Direction of the *Roman* Quarter-Maſters; and if a Man will compare them with *Sanſon*'s, or *Blaeu*'s, he will ſee the difference; which in future Ages will certainly be vaſtly greater, if thoſe Countries which are now barbarous, or undiſcovered, ſhould ever come into the Hands of a Civilized or Learned People. But I have not yet done with the *Load-ſtone*. Beſides

(f) *Commonly called the* Peutingerian *Tables.*

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Beſides theſe occaſional Uſes of the *Magnet*, its Nature, abſtractedly taken, has been nicely enquired into, thereby to diſcover both its own Qualities, and its Relation to other Bodies that are round about it. And here indeed one may juſtly wonder, that when *Flavio Amalphi* (g) had diſcovered that Iron touched with a *Magnet*, always points towards the North, that all the Philoſophers of that Age did not immediately try all Manner of Experiments upon that ſtrange Stone, which was found to be ſo exceedingly uſeful in Matters of common Life: The *Portuguezes*, who firſt made daring Voyages by the Help of the Compaſs into the Southern and South-Eaſtern Seas, better knew the Value of that rich Diſcovery; but Philoſophy was in thoſe darker Ages divided between the School-men and the Chymiſts; the former preſently ſalved the Buſineſs with their *Subſtantial Forms*, and what they could not comprehend came very properly under the Notion of an *Occult Quality*: The latter found nothing extraordinary in their Crucibles when they analyzed

(g) *To him this Diſcovery is attributed by* Salmouth *upon* Pancirollus; *others call him* John Goia *of* Amalphi; *but* Gaſſendi, Animad. *Pag.* 364. *ſays, it was found out by a* French-*man, about the Year* MCC. *ſince it is mentioned by one* Guyotus Provineus, *a* French *Poet of that Time, who calls the Compaſs* Marineta; *to which* Gaſſendi *alſo adds, That it was moſt probably a* French *Invention, becauſe the* North-Point *is by all Nations marked in their Compaſſes by a* Flower-de-Luce, *the Arms of* France.

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analyzed the *Magnet*; and ſo they ſeem ſoon to have given it over: Beſides, in thoſe Days few Men ſtudied Chymiſtry with any other Deſign than that of finding out the Philoſopher's Stone, to which the Load-ſtone could do them no further Service than that of ſupplying them with another hard Name to cant with *(h)*. For theſe Reaſons therefore, it lay in a good Meaſure neglected by Men of Letters, till our famous Countryman Dr. *Gilbert* of *Colcheſter*, by a vaſt Number of Experiments, found that *the Earth* was but *a larger Magnet*, and he indeed, was the firſt Author of all theſe magnetical Speculations which have been made ſince that have had the good Fortune to be generally approved. This great Man, whom *Galileo* and *Kepler* expreſs a great Veneration for in their Writings, deſerves here to be mentioned upon another Account, becauſe He, my Lord *Bacon*, and Mr. *Harriot*, all *Engliſh*-men, are the Three Men to whom Monſieur *Des Cartes* was ſo very much obliged for the firſt Hints of the greateſt things, which he has given us in his Philoſophical and Mathematical Diſcourſes. For nothing does more convincingly put theſe things out of Doubt, than to trace them up to their firſt Originals, which can be done

(h) Magneſia Nigra, *uſed by* Eyrenæus Philalethes, *and ridiculed by* Surly *in* Ben Johnſon's Alchemiſt.

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done but in a very few. But it is time to proceed.

CHAP. XXI.

Of Ancient and Modern Hiſtories of Plants.

THE *Natural Hiſtory of Plants* comes next; which, for Variety and Uſe, is one of the nobleſt and pleaſanteſt Parts of Knowledge. Its Mechanical and Medicinal Advantages were early known. Fruits afforded the firſt Suſtenance to Mankind; and the old Heathens eſteemed thoſe worthy of Conſecration, who taught them to till their Grounds, gather their Seed, and grind their Corn; with Trees they built themſelves Houſes, afterwards they found that the Bark of ſome Plants would ſerve for Cloaths, and others afforded Medicines againſt Wounds and Diſeaſes. There is no doubt therefore, but this Part of Knowledge was ſufficiently cultivated for the Uſes of humane Life; eſpecially when the World becoming Populous, had communicated their Notions together, and Converſation had introduced the Arts of Luxury

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Luxury and Plenty amongſt Mankind. But whether the *Natural Hiſtory of Plants* was ſo exactly known formerly as it is at preſent, is the Queſtion.

The ancienteſt Writers of *Plants* now extant, are *Theophraſtus*, *Pliny* and *Dioſcorides*; indeed the only ones who ſay any thing conſiderable to the preſent Purpoſe. *Theophraſtus* deſcribes nothing; gives abundance of Obſervations of ſeveral Plants, and the like; but what he ſays is too general for our Purpoſe. *Pliny* and *Dioſcorides* who lived long after him do give Deſcriptions indeed of a great many Plants, but ſhort, imperfect and without Method; they will tell you for Inſtance, that a Plant is hairy, has broad Leaves, that its Stalks are knotty, hollow or ſquare; that its Branches creep upon the Ground, are erect, and ſo forth; in ſhort, if there is any thing remarkable in the Colour or Shape of the Stalk, Root, Seed, Flower or Fruit, which ſtrikes the Eye at firſt Sight, it may perhaps be taken Notice of, but then every thing is confuſed, and ſeldom above one or two Plants of a ſort are mentioned; though perhaps later *Botaniſts* have obſerved ſome Scores plainly reducible to the ſame general Head. *Pliny* ranges many of the Plants, which he deſcribes in an Order *(i)*

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(i) N. H. l. 12. cap. 13. and l. 27. throughout.

(k) *The 12th. Book is chiefly of Trees which bear odoriferous Gums, and so on of all the rest.*

(l) N. H. l. 25. cap. 6, 7. & alibi passim.

Order (*i*) something Alphabetical, others (*k*) he digests according to their Virtues, others he (*l*) puts together, because they were discovered by great Persons, and called by their Discoverers Names; all which Methods, how much soever they may assist the Memory in remembring hard Names, or in retaining the *Materia Medica* in one View in a Man's Head, signifie nothing to the Understanding the Characteristical Differences of the several Plants; by which alone, and not by accidental Agreements in Virtue, Smell, Colour, Taste, Place of Growth, Time of sprouting, or any mechanical Use to which they may be made serviceable, Men may become exact *Botanists*: Without such a Method, to which the Ancients were altogether Strangers, the Knowledge of Plants is a confused thing depending wholly upon an uncommon Strength of Memory and Imagination, and even with the Help of the best Books scarce attainable without a Master.

Conradus Gesner, to whose Labours the World has been unspeakably beholden in almost all Parts of Natural History, was the first Man (that I know of) who hinted at the true Way to distinguish Plants, and reduce them to fixed and certain Heads. In a Letter to *Theodorus Zuingerus*

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Zuingerus (m), he ſays, that Plants are to be ranged according to the Shape of their Flowers, Fruits and Seeds; having obſerved that Cultivation, or any accidental Difference of Soil, never alters the Shape of theſe more Eſſential Parts; but that every Plant has ſomething there peculiar, by which it may be diſtinguiſhed, not only from others of a remoter *Genus*, but alſo from thoſe of the ſame Family.

(m) Epiſt. Medicinal. p. 113.

About the ſame Time *Andreas Caſalpinus*, and *Fabius Columna*, the firſt eſpecially, reduced that into an Art, which *Geſner* had hinted at before; yet what they writ lay neglected, though *Cluſius*, *Caſpar Bauhinus*, *Parkinſon*, *Gerard* and *Johnſon*, and *John Bauhinus* had taken very laudable Pains in deſcribing, not only the more general Sorts taken notice of by the Ancients, but alſo in obſerving their ſeveral Sub-diviſions with great Niceneſs and Skill. *John Bauhinus* alſo had deſcribed every particular Plant then known, in his *General Hiſtory of Plants*, with great Accuracy; and compared whatſoever had been ſaid before, and adjuſted old Names to thoſe Plants which Modern Herbariſts had gathered, with ſo much Care, that the Philological Part of *Botany* ſeems by him to have,

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have, in a manner, received its utmoſt Perfection.

The great Work already begun by *Caſalpinus* and *Columna*, was ſtill imperfect; which, though, perhaps, not the moſt laborious, was yet the moſt neceſſary to a Man that would conſider thoſe Things Philoſophically, and comprehend the whole Vegetable Kingdom, as the Chymiſts call it, under one View. This was, to digeſt every Species of Plants under ſuch and ſuch Families and Tribes; that ſo, by the help of a general Method, taken only from the Plants themſelves, and not from any accidental Reſpects, under which they may be conſidered, once thoroughly underſtood, a Learner might not be at a Loſs upon the Sight of every new Plant that he meets with, but might diſcern its General Head at firſt View; and then, by running over the Tables thereunto belonging, might, at laſt, either come to the particular Species which he ſought for, or, which would do as well, find that the Plant before him was hitherto undeſcribed, and that by it there would be a new acceſſion made to the old Stock. Mr. *Ray* drew a rough Draught of this Matter, in the *Tables of Plants* inſerted into Biſhop *Wilkins*'s Book, *of a Real Character*, and *Philoſophical*

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phical Language; and was ſoon followed by Dr. *Moriſon*, in his *Hortus Regius Bleſenſis*; who, purſuant to his own Method, begun *a General Hiſtory of Plants*; which he not living to finiſh, Mr. *Ray* undertook the whole Work anew, and very happily compleated it.

This great Performance of his, which will be a ſtanding Monument of Modern Induſtry and Exactneſs, deſerves to be more particularly deſcribed. Firſt, therefore, He gives an Anatomical Account, from *Malpighius* and *Grew*, of Plants in general: And becauſe the Ancients had ſaid nothing upon that Subject, of which, for want of Microſcopes, they could only have a very obſcure Notion, all that he ſays upon that Head is Modern. Afterwards, when he comes to particular Plants, he draws up Tables, to which he reduces the whole Vegetable Kingdom, except a very few irregular Plants, which ſtand by themſelves. Theſe Tables are taken from the Shape of the Flowers, Seeds, Seed-veſſels, Stalks and Leaves; from the Number or Order of theſe when determined, and Irregularity when undetermined; from the Want, or having of particular Juices, Lympha's, Milks, Oils, Roſins, or the like: In ſhort, from Differences, or Agreements, wholly ari-

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ſing from the Plants themſelves. His Deſcriptions are exacter than *John Bauhine*'s; and his are much better than thoſe of the Generality of Botaniſts that were before him; and there are ſcarce any of theirs, which are not preferable to thoſe of *Pliny*, and *Dioſcorides*. He avoids Confuſion of Synonymas, which had made former Authors tedious; and by inſerting what was already extant in the *Malabar Garden*, *Boym*'s *Flora Sinenſis*, *Marcgravius*'s *Natural Hiſtory of* Braſil, *Hernandez*'s *Account of the Plants of* Mexico, *Cornutus*'s *Hiſtory of the Plants of* Canada, and other *Indian* Accounts of Natural Rareties, into his General Hiſtory, has ſhewed, that the Moderns have been as careful to compleat the Natural Hiſtory of remoter Countries, as to underſtand the Productions of their own.

It may be wonder'd at, perhaps, why I ſhould mention this, ſince the Ancients were not to be blamed for being ignorant of Things which they had no Opportunities of knowing. But, beſides that it proves the Extent of Modern Knowledge in Natural Hiſtory, which may be conſidered, without any Regard to the Opportunities of acquiring it, it proves alſo, againſt Sir *William Temple*, that the Moderns have done what they could in every

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Point, to make the greateſt Uſe they were able of every Addition to their former Knowledge, which might accrue to them by the Diſcovery of the Uſefulneſs of the *Load-Stone* in Navigation. His Words are theſe; *(n) The vaſt Continents of* China, *the* Eaſt *and* Weſt-Indies, *the long Extent and Coaſts of* Africa, *have been hereby introduced into our Acquaintance, and our Maps; and great Increaſes of Wealth and Luxury, but none of Knowledge brought among us, further than the Extent and Situation of Country, the Cuſtoms and Manners of ſo many Original Nations.—— I do not doubt but many great and more noble Uſes would have been made of ſuch Conqueſts, or Diſcoveries, if they had fallen to the Share of the* Greeks *and* Romans, *in thoſe Ages, when Knowledge and Fame were in as great Requeſt as endleſs Gains and Wealth are among us now: And how much greater Diſcoveries might have been made by ſuch Spirits as theirs, is hard to gueſs.* Sir *William Temple* here owns, that the *Political* Uſes which can be made by ſuch Diſcoveries, are inconſiderable; though, at the ſame Time, he confeſſes, that even thoſe have not been neglected, ſince he acknowledges that Men have brought from thoſe Barbarous Nations *their Cuſtoms and Manners*;

(n) Page 490.

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which is the only Political Uſe that I know of that is to be learnt by Travel. What other Advantages might have been made, is hard to tell, unleſs ſuch as may conduce to the Compleating of Natural Hiſtory; the Benefits whereof are agreed upon of all Hands to be very great. The Subject now before me is *Botanics*, which has been ſo far from being neglected, that all imaginable Care has been taken to compleat it. Monſieur *Van Rheed*, the noble Collector of the Plants that are ſo magnificently printed in the Eleven Volumes of the *Hortus Malabaricus*, has added more to the Number of thoſe formerly known, than are to be found in all the Writings of the Ancients. When (o) Prince *Maurice* of *Naſſaw*, who gave Sir *William Temple* the wonderful Account of the Parrot which he mentions in his *Memoirs*, was in *Braſil*, he ordered Pictures and Deſcriptions to be taken of all the Beaſts, Birds, Fiſhes and Plants that could be found in that Country: They are now in the Elector of *Brandenburgh*'s Library, fit for the Preſs. Every Day new Additions are made to this Part of Natural Hiſtory. *Breynius*'s, *Plukenet*'s, and *Herman*'s Collections, are Modern to thoſe of *Cluſius*, *Rauwolfius*, and *Proſper Alpinus*; as theirs are to thoſe of *Pliny*,

(o) *Mentzel.* Index Plantar. Multiling. *in Præfatione.*

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Pliny, and *Dioſcorides*. One is alſo to conſider, that this is a much more laborious Buſineſs, than the Knowledge of Fowls, Fiſhes, and Quadrupeds. The Confuſion in which the Ancients left *Botanical Knowledge*, ſhews how little they underſtood it. And, which is ſtill more remarkable, it is not only in *Indian* or *Chineſe* Rareties, that our *Botanical Knowledge* excels theirs; but in the Productions of Countries, equally acceſſible to them, as to us. There are no new Species in *Europe* or *Aſia*, which the Ancient Herbariſts could not have diſcovered; no new Soils to produce them without Seed, in caſe ſuch a Thing were ever naturally poſſible. Let but a Man compare Mr. *Ray*'s *Catalogue of Engliſh Plants*, and thoſe other numerous Catalogues of the Plants of other Countries, drawn up by other Modern Botaniſts, with the Writings of *Pliny* and *Dioſcorides*; let him run over *Ray*'s *General Hiſtory*, or, if that be not at hand, *Gerard*'s, *Parkinſon*'s, or *John Bauhine*'s *Herbals*, or *Gaſpar Bauhine*'s *Pinax*; and deduct every Plant, not growing wild, within the Limits of the *Roman* Empire, and he will ſee enough to convince him, that not only this Part of Knowledge is incomparably more exact and large than it was formerly;

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merly; but also, by comparing the Writings of the first Restorers of the Knowledge of Simples, *Matthiolus*, *Dodonæus*, *Fuchsius*, *Turner*, and the rest, with the Writings of *Ray* and *Morison*, that it has been always growing, and will do so still, till the Subject is exhausted.

It is well known that Travelling in *Mahometan* Countries is very dangerous; that it is what no Man that makes Learning his Aim in Journeying, would willingly undertake, if he were not very ardently possessed with the Love of it. So that whatsoever Perils the *Ancient Sages* endured in their Journeys into *Egypt* for Knowledge, are equalled at least, if not out-done, by our *Modern Sages*; to use that Word, in Sir *William Temple*'s Sence, for one that goes far and near to seek for Knowledge. Nay, I may safely add, that a few inquisitive and learned Travellers, such as *Rauwolfius*, *Prosper Alpinus*, *Bellonius*, *Guillandinus*, and Sir *George Wheeler*, have acquainted the learned Men of these Parts of the World with the Natural History of the Countries of the *Levant*, not only better than they could have known it by reading the Books of the Ancients; but, in many Particulars, better than the Ancients themselves, Natives of those very Countries, knew it, if

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the extant Books can enable us to give a competent Judgment in this Matter. And if Travelling far for Knowledge be sufficient to recommend the Ancients to our Imitation, I may observe, that Mr. *Edmond Halley*, who went to *St. Helena*, an Island situate in the 16th Degree of Southern Latitude, to take an Account of the Fixed Stars in the Southern Hemisphere, which are never visible to us who live in the Northern; and to *Dantzick*, to conferr about Astronomical Matters, with the great *Hevelius*, has taken much larger Journeys than any of the Ancients ever did in the sole Pursuit of knowledge. So much for the *Natural History of Bodies not endued with Sensitive Life.*

CHAP. XXII.

Of Ancient and Modern Histories of Animals.

Insects seem to be the lowest and simplest Order of Animals; for which Reason I shall begin with them. That some are very beneficial to Man, affording him Food and Rayment; as, the *Bee*, and the *Silk-Worm*: And others, again,

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very troubleſome; as, *Waſps*, *Hornets*, *Gnats*, *Moths*, and abundance more; was formerly as well known as now. In their Obſervations about *Bees*, the Ancients were very curious. *Pliny* (p) mentions one *Ariſtomachus*, who ſpent Fifty Eight Years in obſerving them: And it is very evident from him, *Ariſtotle*, and *Ælian*, that, as far as they could make their Obſervations, the Ancients did not neglect to digeſt neceſſary Materials for the Natural Hiſtory of this wonderful and uſeful Inſect. They were ſo particularly careful to collect what they could gather concerning it, that it is to be feared a very great Part of what they ſay is fabulous.

(p) N. H. l. 11. c. 9.

But if they were curious to collect Materials for the Hiſtory of this ſingle Inſect, they were, in the main, as negligent about the reſt. They had, indeed, Names for general Sorts of moſt of them; and they took notice of ſome, though but few, remarkable Sub-diviſions. The Extent of their Knowledge in this Particular has been nicely ſhewn by *Aldrovandus* and *Mouſet*. In their Writings one may ſee, that the Ancients knew nothing of many Sorts; and of thoſe which they mention, they give very indifferent Deſcriptions; contenting themſelves with ſuch

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ſuch Accounts as might, perhaps, refreſh the Memories of thoſe who knew them before, but which could ſignifie very little to thoſe who had never ſeen them. But of their Generation or Anatomy they could know nothing conſiderable, ſince thoſe Things are, in a great Meaſure, owing to Obſervations made by Microſcopes; and having obſerved few Sub-diviſions, they could ſay little to the Ranging of thoſe Inſects which they knew already by diſtinct Characteriſticks, under ſeveral Heads. For want of obſerving the ſeveral Steps of Nature in all their Mutations, and taking notice of the Sagacity of many ſorts of Inſects, in providing convenient Lodgings for themſelves, and fit Harbours for their young ones, both for Shelter and Food, they often took thoſe to be different, which were only the ſame Species at different Seaſons; and thoſe to be near of Kin, which only Chance, not an Identity of Nature, brought together.

The Clearing of all theſe Things is owing to Modern Induſtry, ſince the Time that Sir *William Temple* has ſet as a Period of the Advancement of Modern Knowledge; even within theſe laſt Forty Years. It lies, for the moſt part, in a very few Hands; and ſo is the more eaſily

fily traced. In *Italy*, *Malpighius* and *Rhedi* took ſeveral Parts. *Rhedi* (*q*) examined very many general Sorts, thoſe Inſects eſpecially which are believed to be produced from the Putrefaction of Fleſh: Thoſe he found to grow from Eggs laid by other grown Inſects of the ſame Kinds. But he could not trace the Origination of thoſe which are found upon Leaves, Branches, Flowers, and Roots of Trees. The Generation of thoſe was nicely examined by *Malpighius*, in his curious Diſcourſe of *Galls*, which is in the 2d. Part of his *Anatomy of Plants*; wherein he has ſufficiently ſhewn, that thoſe Excreſcencies and Swellings, which appear in Summer upon the Leaves, tender Twigs, Fruits and Roots of many Trees, Shrubs and Herbs, from whence ſeveral ſorts of Inſects ſpring, are all cauſed by Eggs laid there by full grown Inſects of their own Kinds; for which Nature has kindly provided that ſecure Harbour, till they are able to come forth, and take Care of themſelves. But *Rhedi* has gone further yet, and has made many Obſervations upon Inſects that live, and are carried about on the Bodies of other Inſects. His Obſervations have not been weakned by Monſieur *Leewenhoek*, whoſe Glaſſes, which are ſaid to excel any ever yet uſed by

(q) *Experimenta circa Generationem Inſectorum.*

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by other People, ſhewed him the ſame Animals that Monſieur *Rhedi* had diſcovered already; and innumerable ſorts of others, never yet thought of.

Beſides Monſieur *Leeuwenhoek*, there have been two very eminent Men in *Holland* for this Buſineſs; *Goedartius* and *Swammerdam*. *Goedartius*, who was no Philoſopher, but one who, for his Diverſion, took great Delight in painting all ſorts of Inſects, has given very exact Hiſtories of the ſeveral Changes of Caterpillars into Butter-Flies, and Worms or Maggots into Flies; which had never before been taken notice of, as ſpecifically different. Theſe Changes had long before been obſerved in Caterpillars and Maggots by *Ariſtotle*, *Theophraſtus* and *Pliny*: But they, who did, in a manner, all that has been done in this Matter by the Ancients, content themſelves with general Things. They enter not into Minute Enquiries about the ſeveral Species of theſe Animals, which are very numerous: They do not ſtate the Times of their ſeveral Changes. So that theſe Matters being left untouched, we have an admirable Specimen of the Modern Advancement of Knowledge, in *Goedartius*'s Papers (*r*).

(*r*) De Inſectis. *Edit. Liſter.*

Still

Still an Anatomical Solution of these Appearances was wholly unknown. What (s) *Ovid* says of the Metamorphoses of Insects, is suitable enough to the Design of his Poem: And there we may well allow such a Natural Change of Caterpillars into Butter-Flies, as is not to be accounted for by the Regular Laws of Growth and Augmentation of Natural Bodies. But a Natural Historian has no need of the Fictions of a Poet. These Difficulties therefore were cleared by *Swammerdam.* (t), who, in his *General History of Insects*, proves, that all the Parts of the full-grown Insect, which first appears in a different Form from what it assumes afterwards, were actually existent in the *Fœtus*, which creeps about as a Caterpillar, or a Maggot, till the Wings, Horns and Feet, which are inclosed in fine Membranes, come to their full Growth; at which Time that Membrane, which at first was only visible, dries up, and breaks; out of which comes forth the Insect proper to that Kind; which then gendring with its like, lays such Eggs as in a seasonable Time are hatched; that so the Species, which is not generated by Chance, may always be preserved.

(s) Metam. l. 15.

(t) Hist. General. Insect.

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In *England*, Dr. *Lister* has done the moſt to compleat this Part of Natural Hiſtory. His Book *of Spiders* gives an Account of very many Species of thoſe Animals, formerly unobſerved. His *Latin and Engliſh Editions of* Goedartius, have not only made that Author more intelligible, by ranging his confuſed Obſervations under certain Heads conformable to Nature, which may ſerve alſo as Foundations to enlarge upon, as more Species ſhall hereafter be diſcovered; but alſo have given him an Opportunity of ſaying many new Things, pertinent to that Subject, all tending to increaſe our Knowledge of thoſe ſmall Productions of the Divine Mechanicks. And his Diſcourſe *of Snails*, lately printed, has ſhewn ſeveral very curious Things in that wonderful Tribe of Animals; which, though obſerved above Thirty Years ago, by Mr. *Ray*, yet had not been much believed, becauſe not ſufficiently illuſtrated by ſome able Anatomiſt.

This is what our Age has ſeen; and it is not the leſs admirable, becauſe it cannot be made immediately uſeful to humane Life: It is an excellent Argument to prove, That it is not Gain alone which biaſſes the Purſuits of the Men of this Age after Knowledge; for here are numerous

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numerous Inſtances of Learned Men, who finding other Parts of Natural Learning taken up by Men, who in all Probability would leave little for After-comers, have, rather than not contribute their Proportion towards the Advancement of Knowledge, ſpent a World of Time, Pains and Coſt, in examining the Excreſcencies of all the Parts of Trees, Shrubs, and Herbs, in obſerving the critical Times of the Changes of all ſorts of Caterpillars and Maggots, in finding out by the Knife and Microſcopes the minuteſt parts of the ſmalleſt Animals, in examining every Crevice, and poring in every Ditch, in tracing every Inſect up to its Original Egg, and all this with as great Diligence, as if they had had an *Alexander* to have given them as many Talents, as he is ſaid to have given to his Maſter *Ariſtotle*.

I ſhall put *Fiſhes*, *Fowls* and *Quadrupeds* together, becauſe the Queſtion as it relates to the Natural Hiſtory of theſe Animals, may be brought into a ſmall Compaſs. For as to the Anatomical part it is certain, That every Inſtance of the Defect of Ancient Anatomy already mentioned, is a Proof how little the Texture of the inward Parts of all theſe Creatures could poſſibly be known, and conſequently

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ly that no Old Deſcriptions of theſe Animals which ſhould go beyond the parts immediately viſible would have been conſiderable. There is hardly one eminent Modern Diſcovery in Anatomy, which was not firſt found in Brutes, and afterwards adjuſted to humane Bodies. Many of them could never have been known without the Help of Live-diſſections; and the reſt required Abundance of Trials upon great Numbers of different ſorts of Beaſts, ſome appearing plainer in one ſort of Animals, and ſome in another, before the Diſcoverers themſelves could frame ſuch a clear Idea of the things which they were then in Purſuit of, as that they could readily look for them in Humane Bodies; which could not be procured in ſo great Plenty, and of which they had not always the Convenience. All which things extremely tended to the perfecting of the Anatomy of all ſorts of Brutes. About the other Part, which may comprehend an Account of their Way of Living, their Uſes to humane Life, their Sagacity, and the like; the Ancients took much Pains, and went very far: And there are a great many admirable things in *Ariſtotle's Hiſtory of Animals* concerning all theſe Matters. What Helps he had from Writers that lived before him we

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we know not; if he had but little, it must be owned that his Book is one of the greatest Instances of Industry and Sagacity that perhaps has ever been given. But since, the Question is not so much, whether that is an excellent Book, as whether it is perfect, it ought to be compared with Mr. *Willoughby*'s *Histories of Fishes and Birds*, and Mr. *Ray*'s *Synopsis of Quadrupeds*, as the perfectest Modern Books upon these Matters; and then it will be easie to make a Judgment. I shall not make it my self, because no Man can mistake, that compares them, though never so negligently, together. I name only *Aristotle*, because he is, to us at least, an original Author: He had examined very many things himself, and though he took a great deal upon trust, yet that could not be avoided, since he had so little, that we know of, from more remote Antiquity, and it was too vast a Work for any one single Man to go through with by himself. *Ælian* and *Pliny* seem only to have copied, and, with Submission be it spoken, their Writings are *Rhapsodies* of Stories and Relations partly true, and partly fabulous, which themselves had not Skill enough to separate one from the other, rather than *Natural Histories*; from which Accusation, even *Aristotle* himself

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himſelf cannot wholly be excuſed. To make this Compariſon the eaſier, one may conſult *Geſner* and *Aldrovandus*; or, if they are too voluminous, *Wotton De Differentiis Animalium*, who has put under one View, in ſeveral Heads, almoſt every thing that is to be found in any ancient Authors concerning theſe things. What he has collected of the Elephant, may be compared with Dr. *Moulin*'s Anatomy of the ſame Creature: The Ancients Obſervation concerning Vipers may be read along with *Rhedi*'s and *Charas*'s. Their Anatomical Deſcriptions of many other Animals may be examined with thoſe publiſhed by the Members of the *French Academy* and Mr. *Ray* in his *Synopſis*: And then the Imperfections of the one, and the Excellencies of the other will be clearly ſeen, and the Diſtance between each exactly ſtated; though perhaps this may ſeem too far about, ſince it is manifeſt at firſt Sight, That no ancient Deſcriptions of any Creatures could be at preſent valuable, when their whole Anatomy was ſo imperfect. Some miſtakes however might, methinks, have been prevented; the *Egyptian Sages* could ſure have taught them that a Crocodile moves his under-Jaw and not his upper; they might ſoon have found that a Lion has

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Vertebres in his Neck, and with them by Conſequence can move it upon Occaſion; and has as large a Heart as other Creatures of his Size; that a (u) *Porcupine* ſhoots out none of his Quills upon thoſe that ſet upon him; and ſeveral other things, which would have prevented ſeveral Over-ſights that are not much for the Honour of *Ancient Diligence*. This would have ſaved Abundance of fabulous Relations that may be found in ancient Naturaliſts. Their heaping up monſtrous Stories without giving diſtinguiſhing Marks many times to teſtifie which they believed, and which not, is an evident Sign, that they were not enough acquainted with theſe Creatures to make a thorough Judgment what might be relied upon, and what ought to be rejected. For accurate Skill in theſe things helps a Man to judge as certainly of thoſe Relations which himſelf never ſaw, as Political Skill does to judge of Accounts of Matters that belong to civil Life, and a great deal better, by how much Nature goes in an evener Courſe than the

(u) Borellus de Motu Animalium Part. II. Prop. 219. *Fabuloſa narratio paſſim circumfertur de Hyſtrice, quæ cutem tendendo, ſpinas illas prælongas quibus dorſum ejus tegitur, longiùs ejaculatur. De hoc Animali enarrabo ea, quæ propriis oculis vidi. Hyſtrix non ejaculatur ſpinas ſuas prælongas, ſed tantummodo eas arrectas retinendo tremulâ concuſſione agitat & vibrat. Hoc quidem efficitur à pelle muſculoſa, & à muſculis ſemilunaribus, quibus interna cutis ſtipata eſt, qui radices ſpinarum erigunt & concutiunt. Vide* quoque Raii Synopſin Animal. Quadruped. Pag. 209.

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the Wills and Fancies of Men, which are the Foundations of moſt of the Things that are tranſacted in the World.

CHAP. XXIII.

Of Ancient and Modern Aſtronomy, and Opticks.

HAving now gone through with the ſeveral Parts of *Natural Hiſtory*, I am to enquire into the State of *Phyſico-Mathematical* and *Phyſical* Sciences: Such as *Aſtronomy*, *Opticks*, *Muſick* and *Medicks*. I put *Aſtronomy* firſt, becauſe of the vaſt Extent, and real Nobleneſs of its Subject; and alſo becauſe it has ſuffered the leaſt Eclipſe of any part of Knowledge whatſoever in the barbarous Times: For when the *Greeks* neglected it, the *Arabs*, and from them the *Spaniards* took it up. That this Enquiry might be the more exactly made, and that you might be throughly convinced of the Truth in this Matter, to which chiefly our Obligation lies, Mr. *Edmond Halley*, whoſe Labours towards the Advancement of this Science, have made him famous in ſo many diſtant Parts of the World, did me

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the Favour to communicate this following Paper.

'As for the Aſtronomy of the Ancients, this is uſually reckoned for one of 'thoſe Sciences wherein conſiſted the 'Learning of the *Egyptians*; and *Strabo* 'expreſly declares, That there were in '*Babylonia* ſeveral Univerſities, wherein 'Aſtronomy was chiefly profeſſed; and '*Pliny* tells us much the ſame thing: So 'that it might well be expected, that 'where ſuch a Science was ſo much ſtudied, it ought to have been proportionably cultivated. Notwithſtanding all 'which it does appear, That there was 'nothing done by the *Chaldæans* older 'than about CCCC Years before *Alexander*'s Conqueſt, that could be ſerviceable either to *Hipparchus*, or *Ptolemee* 'in their Determination of the celeſtial 'Motions: For had there been any Obſervations older than thoſe we have, it 'cannot be doubted but the victorious '*Greeks* muſt have procured them, as well 'as thoſe they did, they being ſtill more 'valuable for their Antiquity. All we 'have of them is only Seven Eclipſes of 'the Moon, preſerved in *Ptolemee*'s *Syntaxis*; and even thoſe, but very courſely ſet down, and the oldeſt not much 'above 700 Years before Chriſt, ſo that

'after

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'after all the Fame of these *Chaldæans*, 'we may be sure they had not gone far 'in this Science; and though *Callisthenes* 'be said by *Porphyry* to have brought 'from *Babylon* to *Greece*, Observations 'above MDCCCC Years older than *A-* 'lexander, yet the proper Authors ma- 'king no Mention, or Use of any such, 'renders it justly suspected for a Fable. 'What the *Egyptians* did in this Matter is 'less evident, no one Observation made by 'them being to be found in their Country- 'man *Ptolemee*, excepting what was done 'by the *Greeks* of *Alexandria*, under 'CCC Years before *Christ*. So that 'whatever was the Learning of these 'Two ancient Nations as to the Motions 'of the Stars, it seems to have been chief- 'ly Theorical, and I will not deny but 'some of them might very long since be 'apprized of the Sun's being the Center 'of our System, for such was the Do- 'ctrine of *Pythagoras*, and *Philolaus*, and 'some others who were said to have tra- 'velled into these Parts.

'From hence it may appear, That the 'Greeks were the first practical Astrono- 'mers, who endeavoured in earnest to 'make themselves Masters of the Sci- 'ence, and to whom we owe all the old 'Observations of the Planets, and of the

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'Equinoxes and Tropicks, *Thales* was 'the first that could predict an Eclipse 'in *Greece*, not DC Years before *Christ*, 'and without doubt it was but a rude 'Account he had of the Motions; and 'twas *Hipparchus* who made the first 'Catalogue of the Fix'd Stars, not above 'CL Years before *Christ*, without which 'Catalogue there could be scarce such a 'Science as Astronomy, and it is to the 'Subtilty and Diligence of that great 'Author, that the World was beholding 'for all its Astronomy for above MD 'Years. All that *Ptolemee* did in his *Syntaxis*, was no more but a bare Transcription of the Theories of *Hipparchus*, 'with some little Emendation of the periodical Motions, after about CCC Years 'Interval; and this Book of *Ptolemee*'s 'was without Dispute, the utmost Perfection of the Ancient Astronomy, nor 'was there any thing in any Nation before it comparable thereto; for which 'Reason all the other Authors thereof 'were disregarded and lost; and among 'them *Hipparchus* himself. Nor did Posterity dare to alter the Theories delivered by *Ptolemee*, though successively *Albategnius* and the *Arabs*, and after them the *Spanish* Astronomers under *Alphonsus*, endeavoured to amend the Errors

'rors they obſerved in their Computa-
'tions. But their Labours were fruitleſs,
'whilſt from the Defects of their Prin-
'ciples, it was impoſſible to reconcile
'the Moon's Motion within a Degree,
'nor the Planets, *Mars* and *Mercury*, to
'a much greater Space.

'Now in this Science to compare the
'Ancients with the Moderns, and ſo make
'a Parallel as juſt as may be, I oppoſe the
'Noble *Tycho Brahe*, or *Hevelius* to *Hip-*
'*parchus*, and *John Kepler* to *Claudius*
'*Ptolemee*; and I ſuppoſe no one acquain-
'ted with the Stars will doubt, That the
'Catalogue of the Fix'd-Stars made by
'*Tycho Brahe*, about C Years ſince, does
'beyond Competition far excel that of
'*Hipparchus*, being commonly true to a
'Minute or Two, when the other many
'times fails half a Degree, both in Lon-
'gitude and Latitude; and this is the
'fairlier carried, for that it was as eaſie
'for *Hipparchus* to obſerve the Fixd'-Stars,
'as for *Tycho*, or *Hevelius*, had he made
'Uſe of the ſame Induſtry and Inſtru-
'ments, the Teleſcope wherewith we
'now obſerve to the utmoſt poſſible Nice-
'ty, being equally unknown to *Tycho* as to
'*Hipparchus*, and not uſed by *Hevelius*.
'But what may juſtly be expected from
'Monſieur *Caſſini* and Mr. *Flamſteed* in

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'this Matter, does yet further advance in 'preciſeneſs, as not capable to err half a 'minute, though made with Inſtru-
(w) p. 57. 'ments (w) *of the Production of* Gre- 'ſham. As to the other Compariſon be- 'tween *Kepler* and *Ptolemee*, I queſtion 'not but all that can judge, will be fully 'convinced that the Hypotheſis of Ec- 'centricks, and Epicycles introduced by 'the Ancients only to repreſent the Mo- 'tions, and that but courſely too; with 'the Opinion of *Ptolemee* himſelf thereon, 'that the natural Motions were other- 'wiſe performed, ought not to be valued 'againſt that elegant Theory of the pla- 'netary Motions, firſt invented by the 'acute Diligence of *Kepler*, and now late- 'ly demonſtrated by that excellent Geo- 'meter Mr. *Newton*, *viz. That all the 'Planets move in Elliptick Orbs about the 'Sun, at whoſe Center, being placed in one 'Focus of the Eclipſe, they deſcribe equal 'Area's in equal times*; this, as it is the 'neceſſary reſult of the Laws of Motion 'and Gravity, is alſo found rigorouſly to 'anſwer to all that is obſerved in the Mo- 'tions, ſo that the Moderns may, with 'as much Reaſon as in any other Science 'whatſoever, value themſelves on their 'having improved, I had almoſt ſaid per- 'fected, this of *Aſtronomy*.

Optical

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Optical Inſtruments have been ſo ſerviceable in the Advancement of *Aſtronomy*, that the Sciences which demonſtrate their wonderful Properties ought next to be conſidered. Here alſo I muſt own my Obligation to Mr. *Halley* for this following Account of what the Ancients have done in them, and how much they have been out-done by Modern Mathematicians.

'I ſuppoſe there are few ſo thorough-'paced Fautors of Antiquity, as to brag 'much of their Skill, either in *Opticks*, 'or *Dioptricks*. Their Want of *Opticks* 'appears in their Want of Authors treat-'ing thereon; and yet much better in 'their Want of *Ordonnance*, (as it is cal-'led) in their Paintings, and *Baſſe Re-'lieve's*, as has been already ſaid in its 'proper Place. And as to *Dioptricks*, 'though ſome of the Ancients mention '*Refraction* as a natural Effect of tranſpa-'rent *Media*, yet *Des Cartes* was the firſt 'who, in this Age, has diſcovered the 'Laws of *Refraction*, and brought *Dio-'ptricks* to a Science. And the Invention 'of *Teleſcopes* and *Microſcopes*; which 'muſt be wholly allowed to this Centu-'ry, has received no ſmall Improvements 'from the Study and Charge of Sir *Paul 'Neile*, and ſome other *Members of Gre-*

'*ſham.*

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'*Steam*. And these are such Instruments 'of real Knowledge, that though we 'will allow the Ancients to have done all 'that great *Genii*, with due Application, 'could arrive at; yet, for want of them, 'their Philosophical Argumentation could 'not come up to the present Pitch; 'not being able to fathom the boundless 'Depths of the Heavens, nor to unravel 'the *Minutiæ* of Nature, without the 'Assistance of the Glasses we are now 'possessed of'.

CHAP. XXIV.

Of Ancient and Modern Musick.

SIR *William Temple* having assured us (x), that *it is agreed by the Learned, that the Science of* Musick, *so admired by the Ancients, is wholly lost in the World: And that what we have now, is made up of certain Notes that fell into the Fancy of a poor Friar, in chanting his Mattins.* It may seem improper to speak of *Musick* here, which ought rather to have been ranked amongst those Sciences, wherein the Moderns have, upon a strict Enquiry, been found to have been out-done by the

(x) Pag. 45.

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the Ancients. I have chosen, however, to speak of it in this Place, for these following Reasons.

I. That whereas all Modern Mathematicians have paid a mighty Deference to the Ancients; and have not only used the Names of *Archimedes*, *Apollonius* and *Diophantus*, and the other Ancient Mathematicians, with great Respect; but have also acknowledged, that what further Advancements have since been made, are, in a manner, wholly owing to the first Rudiments, formerly taught: Modern Musicians have rarely made use of the Writings of *Aristoxenus*, *Ptolemee*, and the rest of the Ancient Musicians; and, of those that have studied them, very few, unless their Editors, have confessed that they could understand them; and others have laid them so far aside, as useless for their Purpose; that it is very probable, that many excellent Composers have scarce ever heard of their Names.

II. *Musick* has still, and always will have very lasting Charms. Wherefore, since the Moderns have used their utmost Diligence to improve whatever was improvable in the Writings of all sorts of Ancient Authors, upon other equally difficult, and very often not so delightful Subjects, one can hardly imagine but that

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that the World would, long ere now, have heard ſomething more demonſtrably proved of the Comparative Perfection of Ancient *Muſick*, with large Harangues in the Commendation of the reſpective Inventors, if their Memory had been preſerved, than barely an Account of the fabulous Stories of *Orpheus* or *Amphion*, which either have no Foundation at all; or, as *Horace* of old underſtood them (*y*), are allegorically to be interpreted of their reducing a Wild and Salvage People to Order and Regularity. But this is not urged againſt Sir *William Temple*, who is not convinced of the Extent of Modern Induſtry, Sagacity, and Curioſity; though to other Admirers of Ancient *Muſick*, who, upon Hear-ſay, believe it to be more perfect than the Modern, and yet are, for other Reaſons, ſufficiently convinced of the unwearied Diligence, and anſwerable Succeſs of the Modern Learned, in retrieving and improving other Parts of Ancient Knowledge, it will not appear inconſiderable.

(*y*) *Silveſtres homines, ſacer interpresq; Deorum,*
Cædibus & victu fœdo deterruit Orpheus:
Dictus ob hoc lenire Tigres rabidosq; Leones.
Dictus & Amphion, Thebanæ conditor arcis,
Saxa movere ſono Teſtudinis, & prece blandâ,
Ducere quo vellet.
Art. Poet.

III. *Muſick* is a *Phyſico-Mathematical* Science, built upon fixed Rules, and ſtated Proportions; which, one would think,

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think, might have been as well improved upon the old Foundations, as upon new ones, ſince the Grounds of *Muſick* have always been the ſame: And *Guido*'s *Scale*, as Dr. *Wallis* aſſures us, is the ſame for Subſtance with the *Diagramma Veterum*.

IV. The Ancients had not, in the Opinion of ſeveral who are Judges of the Matter, ſo many Gradations of Half-Notes and Quarter-Notes between the Whole Ones as are now uſed; which muſt of neceſſity introduce an unſpeakable Variety into Modern *Muſick*, more than could formerly be had: Becauſe it is in Notes, as it is in Numbers; the more there are of them, the more variouſly they may be combined together.

V. Exceſſive Commendations can ſignifie nothing here, becauſe every Man gives the higheſt Applauſes to the perfecteſt Thing he ever ſaw, or heard, of any Kind. And if he is not capable of inventing any Thing further in that Way himſelf, he can form no Idea of it, beyond what himſelf was at that Time affected with.

VI. It is very probable that the Ancient *Muſick* had all that which ſtill moſt affects common Hearers. Moſt Men are moved with an excellent Voice, are pleaſed when Time is exactly kept, and love to

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to hear an Inſtrument played true to a fine Voice, when the one does not ſo far drown the other, but that they can readily underſtand what is ſung, and can, without previous Skill, perceive that the one exactly anſwers the other throughout; and their Paſſions will be effectually moved with ſprightly or lamentable Compoſitions: In all which Things the Ancients, probably, were very perfect. To theſe Men, many of our Modern Compoſitions, where ſeveral Parts are ſung or played at the ſame Time, would ſeem confuſed, intricate, and unpleaſant: Though in ſuch Compoſitions, the greater this ſeeming Confuſion, the more Pleaſure does the skilful Hearer take in unravelling every ſeveral Part, and in obſerving how artfully thoſe ſeemingly diſagreeing Tones joyn, like true-cut Tallies, one within another, to make up that united Concord, which very often gives little Satisfaction to common Ears; and yet it is in ſuch ſort of Compoſitions, that the Excellency of Modern *Muſick* chiefly conſiſts. For, in making a Judgment of *Muſick*, it is much the ſame Thing as it is of Pictures. A great Judge in *Painting* does not gaze upon an exquiſite Piece ſo much to raiſe his Paſſions, as to inform his Judgment, as to approve, or to find fault:

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fault. His Eye runs over every Part, to find out every Excellency; and his Pleasure lies in the Reflex Act of his Mind, when he knows that he can judiciously tell where every Beauty lies, or where the Defects are discernable: Which an ordinary Spectator would never find out. The chiefest Things which this Man minds, is the Story; and if that is lively represented, if the Figures do not laugh when they should weep, or weep when they should appear pleased, he is satisfied: And this, perhaps, equally well, if the Piece be drawn by *Raphael*, as by an ordinary Master, who is just able to make Things look like Life. So likewise in *Musick*; He that hears a *numerous* Song, set to a very moving Tune, exquisitely sung to a sweet Instrument, will find his Passions raised, whilst his Understanding, possibly, may have little or no Share in the Business. He scarce knows, perhaps, the Names of the Notes, and so can be affected only with an Harmony, of which he can render no Account. To this Man, what is intricate, appears confused; and therefore he can make no Judgment of the true Excellency of those Things, which seem *fiddling* to him only, for want of Skill in *Musick*. Whereas on the contrary, the Skill or Ignorance

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Ignorance of the Compoſer ſerve rather to entertain the Underſtanding, than to gratifie the Paſſions of a skilful Maſter; whoſe Paſſions are then the moſt thoroughly raiſed, when his Underſtanding receives the greateſt Satisfaction.

VII. It will be difficult to form a juſt Idea of the Pleaſure which the Ancient *Muſick* afforded, unleſs one reflects upon the confeſſedly unimitable Sweetneſs of the Ancient *Poetry*, the *Greek* eſpecially; which, when ſung by clear and ſweet Voices, in ſuch a manner, as that the Hearer never loſt a Syllable, could ſcarce fail of producing thoſe Emotions of Soul which the Poet intended to raiſe. And, indeed, the great End of *Muſick*, which is to pleaſe the Audience, was anciently, perhaps, better anſwered than now; though a Modern Maſter would then have been diſ-ſatisfied, becauſe ſuch Conſorts as the Ancient *Symphonies* properly were, in which ſeveral Inſtruments, and perhaps Voices, played and ſung the ſame Part together, cannot diſcover the Extent and Perfection of the Art, which here only is to be conſidered, ſo much as the Compoſitions of our Modern *Opera's*.

From all this it may, perhaps, be not unreaſonable to conclude, that though

(z) *thoſe*

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(z) *those Charms of* Musick, *by which Men and Beasts, Fishes, Fowls and Serpents, were so frequently enchanted, and their very Natures changed,* be really and irrecoverably lost; yet the Art of *Musick*, that is to say, of Singing, and Playing upon Harmonious Instruments, is, in it self, much a perfecter Thing, though, perhaps, not much pleasanter to an unskilful Audience, than it ever was amongst the Ancient *Greeks* and *Romans*.

(z) Pag. 45.

CHAP. XXV.

Of Ancient and Modern Physick.

AFter these *Mathematical* Sciences, it is convenient to go to those which are more properly *Physical*, and in our Language alone peculiarly so called. What these want in Certainty, they have made up in Usefulness: For, if Life and Health be the greatest good Things which we can enjoy here, a Conjectural Knowledge, that may but sometimes give us Relief when those are in danger, is much more valuable than a certain knowledge of other Things, which can

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only employ the Understanding, or furnish us with such Conveniencies as may be spared; since we see that several Nations which never had them lived very happily, and did very great Things in the World.

Before I begin my Comparison between *Ancient* and *Modern* Skill in *Physick*, it may be necessary to state the Difference between an *Empirick*, and a *Rational Physician*; and to enquire how far a *Rational Physician* may reason right, as to what relates to the curing of his Patient's Distemper, though his general Hypotheses be wrong, and his Theories, in themselves considered, insufficient. An *Empirick* is properly he who, without considering the Constitution of his Patient, the Symptoms of his Disease, or those Circumstances of his Case which arise from outward Accidents, administers such *Physick* as has formerly done good to some Body else that was tormented with a Disease which was called by the same Name with this that his Patient now labours under. A *Rational Physician* is he who critically enquires into the Constitution, and peculiar Accidents of Life, of the Person to whom he is to administer; who weighs all the known Virtues of the Medicines which may be thought

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thought proper to the Caſe in hand; who balances all the Symptoms, and, from paſt Obſervations, finds which have been fatal, and which ſafe; which ariſe from outward Accidents, and which from the Diſeaſe it ſelf: And who thence collects, which ought ſooneſt to be removed, which may be neglected, and which ſhould be preſerved or augmented; and thereupon preſcribes accordingly.

Now it is evident, that ſuch a Man's Preſcriptions may be very valuable, becauſe founded upon repeated Obſervations of the Phænomena of all Diſeaſes. And he may form Secondary Theories, which, like *Ptolemee*'s *Eccentricks* and *Epicycles*, ſhall be good Guides to Practice; not by giving a certain Inſight into the firſt Cauſes, and ſeveral Steps, by which the Diſeaſe firſt began, and was afterwards carried on; but by enabling the Phyſician to make lucky Conjectures at proper Courſes, and fit Medicines, whereby to relieve or cure his Patient. And this may be equally ſucceſsful, whether he reſolves every Thing into Hot or Cold, Moiſt or Dry; into Acids, or *Alkali's*; into Salt, Sulphur, or *Mercury*; or into any Thing elſe. He does not know, for Inſtance, that Spittle, Bile, and the Pancreatick Juice, are the main Inſtruments of Di-

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geſtion; yet he ſees that his Patient digeſts his Meat with great Difficulty: He is ſure that, as long as that laſts, the ſick Man cannot have a good Habit of Body; he finds that the Diſtemper ariſes ſometimes, though not always, from a viſible Cauſe; and he has tried the Goodneſs of ſuch and ſuch Medicines, in ſeemingly parallel Caſes. He may be able therefore to give very excellent Advice, though he cannot, perhaps, dive into the Nature of the Diſtemper ſo well as another Man; who having greater Anatomical Helps, and being accuſtomed to reaſon upon more certain Phyſiological Principles, has made a ſtrict Enquiry into that very Caſe: And ſo by Conſequence, though he cannot be ſaid to know ſo much of the Eſſence of the Diſeaſe as that other Man, yet, perhaps, their Method of Practice, notwithſtanding the great Diſparity of each others Knowledge, ſhall be, in the main, the ſame.

Though all this ſeems very certain, yet, in the Argument before us, it is not an eaſie Thing to ſtate the Queſtion ſo equally, as to ſatisfie all contending Sides. He that looks into the Writings of the Generality of the *Rational Phyſicians*, as they called themſelves, by way of Eminence; that is to ſay, of thoſe who, about

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about Fifty Years ago, ſet up *Hippocrates* and *Galen*, as the Parents and Perfecters of Medicinal Knowledge, will find, throughout all their Writings, great Contempt of every Thing that is not plainly deducible from thoſe Texts. On the other Hand, If he dips into the Books of the Chymical Philoſophers, he will meet with equal Scorn of thoſe Books and Methods, which they, in Deriſion, have called *Galenical*. And yet it is evident, that practiſing Phyſicians of both Parties have often wrought very extraordinary Cures by their own Methods. So that there ſeems to have been equal Injuſtice of all Hands, in excluding all Methods of Cure not built upon their own Principles. Here therefore, without being poſitive in a Diſpute, about which the Parties concerned are not themſelves agreed, I ſhall only offer theſe few Things. (1.) That if the Greatneſs of any one particular Genius were all that was to be looked after, *Hippocrates* alone ſeems to have been the Man, whoſe Aſſertions in the Practical Part of Phyſick might be blindly received: For he, without the Help of any great Aſſiſtances that we know of, did that which, if it were ſtill to do, would ſeem ſufficient to employ the united Force of more than one Age. He was ſcrupulouſly

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exact in distinguishing Diseases, in observing the proper Symptoms of each, and taking notice of their Times and Accidents, thereby to make a Judgment how far they might be esteemed dangerous, and how far safe. Herein his particular Excellency seems to have lain; and this, in the Order of Knowledge, is the first Thing that a *Rational Physician* ought to make himself Master of: Which is a sure Argument that *Hippocrates* throughly understood what Things were necessary for him to study with the greatest Care, in order to make his Writings always useful to Posterity. (2.) That though we should allow the Methods of Practice used by the Ancients, to have been as perfect, nay, perfecter than those now in use, which some great Men have eagerly contended for; yet it does not follow, that they understood the whole Compass of their Profession so well as it is now understood; because it is absolutely impossible to form just Theories of all Diseases, so as to lay down the perfectest Methods of Cure possible, which shall be adapted to all Persons, in all Circumstances, till Anatomy and Physiology are perfectly known; and by Consequence, later Theories are always more esteemable, as they are raised upon newer Discoveries in

Anatomy

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Anatomy and Phyſiology: So that we may be ſure no Ancient Theories can be ſo excellent as ſome of thoſe which have been deviſed by Modern Philoſophers. (3.) That if the Addition of every new Medicine be an uſeful Acceſſion to the Body of *Phyſick*, then a new Method of preparing known Medicines; of making thoſe Things profitable and noble Remedies, which before were dreaded as Poyſons, or laid by as uſeleſs; and of trying ſuch Experiments upon Bodies yet unexamined, as will ſoon and certainly diſcover ſome of their moſt principal Virtues muſt be of unſpeakable Advantage, and make the Knowledge of thoſe who poſſeſs ſuch a Method juſtly more valuable than of thoſe who want it. But this relates more particularly to Chymiſtry, of which enough has been ſaid already. (4.) That if the Practice of proper Judges be a reaſonable Prejudice for or againſt any Thing, then this Science has received vaſt Improvements of late Years: For now the Generality of Phyſicians acquieſce in Modern Theories, or, which in the preſent Diſpute is all one, advance new ones upon Anatomical and Phyſical Principles, purſuant to thoſe Diſcoveries which have been lately made. In their Practice they mix *Galenical* and *Chymical*

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Medicines together. They own that *Galenical* Ways of preparing Drugs, anciently made use of in the Practice of *Physick*, are, in many Cases, not so valuable as *Chymical* ones. In short, though they pay a due Respect to the Writings of the Ancients; and in those Things where they find by their own Experience, that the Ancient Observations hold, follow their Directions; yet their constant Language, and as constant Practice, whensoever one opposes Ancient Authorities to them, is, *That the Ancients did very well for their Time; but that Experience, and further Light, has taught them better Things.* This, I must needs own, has very great Weight with me, who am apt, *cæteris paribus*, to believe every Man in his own Way; *Physicians* especially, because their Science is entirely got by a long Series of repeated Experiments and Observations: So that it seems to be almost impossible, but that, in all such Cases, where Men have the Assistance of former Light, and where the Subject upon which they employ their Pains wanted a great deal of that Perfection, which those that study it have an Idea of, as still wanting, and can only be attained by a longer Experience, successive Ages must make great Additions to the former Stock.

(5.) That

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(5.) That though the noble Diſcoveries of theſe latter Ages might, poſſibly, be found in *Hippocrates*, *Ariſtotle* and *Galen*, yet, ſince no Interpreters could ever find them there, till they had been diſcovered anew by Modern Phyſicians, who followed Nature only as their Guide, theſe late Diſcoverers have an equal Right to the Glory due to ſuch Diſcoveries, as the Ancients could poſſibly have: They both copied after the ſame Original; they both decyphered the ſame Characters, that before were unintelligible; not by reading Books, but by trying Experiments, and making Obſervations. And therefore *Vander Linden*, *Almeloveen*, and the reſt of the Bigots for the Ancients, deal very unjuſtly, when they cry out, upon the Sight of any new Diſcovery, *This* Hippocrates *knew*, *This* Ariſtotle *taught*. Could theſe Men have made theſe Diſcoveries by ſtudying thoſe Ancient Authors, without the Aſſiſtance of Dr. *Harvey*, *Aſellius*, *Pecquet*, *Malpighius*, or the reſt? This will hold, in caſe theſe Things had really been in the Ancients: That they are not, I hope I have proved already. To which I ſhall only add, that former Commentators wanted neither *Greek*, nor Skill; and had ſuch Things been in their Writings, they would infallibly have found them there.

It

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It is eaſie now to tell what Acquiſitions have been made ſince *Galen*'s Days. When *Hippocrates* lived, Anatomy was a rude, imperfect Thing: It has ſince been growing; and the Theories of all Diſeaſes have been proportionably more compleat. *Chymiſtry* has been introduced into *Phyſick*; thereby the *Materia Medica* has been enlarged by ſome as noble Medicines as any the Ancients were acquainted with, the Nauſeouſneſs of many Medicines has been removed; and they have been made leſs clogging, and more efficacious, ſince they may be taken in leſſer Quantities, and in more pleaſant Vehicles; to as good, if not better purpoſe than before. *Botanicks* have been unſpeakably enlarged; and thereby alſo the Diſpenſatories have been ſtocked with ſome excellent Remedies, that the old World was unacquainted with. If theſe Particulars be rightly ſtated, as they ſeem to be, they will go very far to decide the Queſtion. And ſo I ſhall leave it, without determining any Thing poſitively about it.

CHAP.

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CHAP. XXVI.

Of Ancient and Modern Natural Philoſophy.

HAving gone through with the moſt conſiderable Branches of *Natural* and *Mathematical Knowledge*, I am now to enquire into the Comparative Excellency of Ancient and Modern *Books of Philoſophy*, thereby to ſee in which of them Nature, and its Operations, are explained beſt. Here I ſhall firſt enquire into the ſeveral *Methods of Philoſophizing*; and afterwards, into the Intrinſick Worth of the Doctrines themſelves. *Moderns* here are taken in a very ſtrict Sence. I ſhall mention none who have made any *(a) Entries upon this noble Stage of Nature* above LXXX. Years ago, ſince the Time of thoſe firſt Flights of the Reſtorers of Learning, that are ſo exceedingly applauded by Sir *William Temple*. For *Natural Philoſophy* was the laſt Part of Knowledge which was cultivated with any particular Care, upon the Revival of Learning; though *Natural Hiſtory*, which is a principal Ground-work, had been long before increaſing, and a conſiderable Heap

(a) Pag. 44.

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Heap of Materials had been collected, in order to the Work.

As for *Modern Methods of Philoſophizing*, as compared with the *Ancient*, I ſhall only obſerve theſe following Particulars. (1.) No Arguments are received as cogent, no Principles are allowed as current, amongſt the celebrated Philoſophers of the preſent Age, but what are in themſelves intelligible; that ſo a Man may frame an Idea of them, of one ſort or other. Matter and Motion, with their ſeveral Qualities, are only conſidered in Modern Solutions of Phyſical Problems. *Subſtantial Forms, Occult Qualities* (b), *Intentional Species, Idioſyncraſies, Sympathies and Antipathies of Things*, are exploded; not becauſe they are Terms uſed by Ancient Philoſophers, but becauſe they are only empty Sounds, Words whereof no Man can form a certain and determinate Idea. (2.) Forming of Sects and Parties in Philoſophy, that ſhall take their Denominations from, and think themſelves obliged to ſtand by the Opinions of any particular Philoſophers, is, in a manner, wholly laid aſide. *Des Cartes* is not more believed upon his own Word, than *Ariſtotle*: Matter of Fact is the only Thing appealed to; and Syſtems are little further regarded, than as they are proper to inſtruct

(b) Pag. 46.

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ſtruct young Beginners, who muſt have a general Notion of the whole Work, before they can ſufficiently comprehend any particular Part of it; and who muſt be taught to reaſon by the Solutions of other Men, before they can be able to give Rational Solutions of their own: In which Caſe, a falſe Hypotheſis, ingeniouſly contrived, may now and then do as much Service as a true one. (3.) Mathematicks are joyned along with Phyſiology, not only as Helps to Men's Underſtandings, and Quickners of their Parts; but as abſolutely neceſſary to the comprehending of the Oeconomy of Nature, in all her Works. (4.) The new Philoſophers, as they are commonly called, avoid making general Concluſions, till they have collected a great Number of Experiments or Obſervations upon the Thing in hand; and, as new Light comes in the old Hypotheſes, fall without any Noiſe or Stir. So that the Inferences that are made from any Enquiries into Natural Things, though perhaps ſet down in general Terms, yet are (as it were by Conſent) received with this Tacit Reſerve, *As far as the Experiments or Obſervations already made, will warrant.*

How

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How much these Four Things will enlarge Natural Philosophy is easie to guess. I do not say that none of these things were anciently done; but only that they were not then so general. The *Corpuscular Philosophy* is in all Probability the oldest, and its Principles are those intelligible ones I just now commended. But its Foundations being very large, and requiring much Time, Cost, and Patience to build any great Matters upon, it soon fell; before it seems to have been throughly understood. For it seems evident, That *Epicurus* minded nothing but the raising of a Sect, which might talk as plausibly as those of *Aristotle*, or *Plato*, since he despised all Manner of Learning, even Mathematicks themselves, and gloried in this, that he spun all his Thoughts out of his own Brain; a good Argument of his Wit indeed, but a very ordinary one of that Skill in Nature, which *Lucretius* extols in him every time that he takes Occasion to speak of him. The whole Ancient Philosophy looks like a thing of Ostentation and Pomp, otherwise I cannot understand why *Plato* should reprove *Eudoxus* and *Archytas*, for trying to make their Skill in Geometry useful in Matters of civil Life, by inventing of Instruments of publick Advantage; or think that

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that thoſe ſublime Truths were debaſed when the unlearned part of Mankind have been the better for them. And therefore, as *Plutarch* complains in his *Life of Marcellus*, Mechanical Arts were deſpiſed by Geometers till *Archimedes*'s Time: Now though this be particularly ſpoken there by *Plutarch* of the making of Inſtruments of Defence and Offence in War, yet it is alſo applicable to all the Ancient Philoſophy and Mathematicks in general. The old Philoſophers ſeemed ſtill to be afraid that the common People ſhould deſpiſe their Arts if commonly underſtood; this made them keep for the moſt Part to thoſe Studies which required few Hands and Mechanical Tools to compleat them: Which to any Man that has a right Notion of the Extent of a natural Philoſopher's Work, will appear abſolutely neceſſary. Above all, the Ancients did not ſeem ſufficiently to underſtand the Connection between Mathematical Proportions of Lines and Solids, in an abſtracted Propoſition, and in every Part of the Creation; at leaſt in their reaſonings about the Cauſes of Natural Things, they did not take any great pains to ſhew it. When *Galen* was to give an Account of Viſion in his Books (*c*) *De Uſu Partium*, becauſe he had

(*c*) De U. P. lib. X. cap. 12, 13, 14.

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had Occaſion to uſe ſome few Geometrical Terms, as *Cone*, *Axis*, *Triangle* and the like; he makes a long Excuſe, and tells a tedious Story of a Dæmon that appeared to him, and commanded him to write what he did; and all this leaſt the Phyſicians of that Age ſhould think that he conjured, and ſo take a Prejudice againſt all that he ſaid. This ſhews that in *Galen*'s Time at leaſt, there was little Correſpondence between Mathematical and Phyſical Sciences, and that Mankind did not believe that there was ſo intimate a Relation between them as it is now generally known there is. Many a Man that cannot demonſtrate any one ſingle Propoſition in *Euclid*, takes it now for granted that Geometry is of infinite Uſe to a Philoſopher; and it is believed now upon truſt, becauſe it is become an Axiom amongſt the Learned in theſe Matters. And if it had been ſo received in *Galen*'s Time, or by thoſe more ancient Authors, whom *Galen*'s Contemporaries followed, or pretended at leaſt to follow, as their Patterns; ſuch as *Hippocrates*, whom all ſides reverenced, *Herophilus*, *Eraſiſtratus*, *Aſclepiades*, and ſeveral more, there would have been no need of any Excuſes for what he was doing; ſince his Readers being accuſtomed to

ſuch

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ſuch ſort of Reaſonings, would either readily have underſtood them, or acquieſced in them as legitimate Ways of Proof. If Three, or Four Mathematical Terms were ſo affrighting, how would thoſe learned Diſcourſes of *Steno* and *Croone*, concerning muſcular Motion have moved them? How much would they have been amazed at ſuch minute Calculations of the Motive-ſtrength of all ſorts of Muſcles in the ſeveral general ſorts of Animals, as require very great Skill in Geometry, even to underſtand them, which are made by *Borellus* in his Diſcourſes *of the Motion of Animals?* It is not enough in this Caſe, to quote a Saying or Two out of ſome great Man amongſt the Ancients, or to tell us that *Plato* ſaid long ago, *That God geometrizes in all his Works*; as long as no Man can produce any one Ancient Eſſay upon any one Part of Phyſiology, where Mathematical Ratiocinations were introduced to ſalve thoſe Phænomena of Natural Things, upon which it was poſſible to talk plauſibly without their Help. At leaſt it is certain, That they contented themſelves with general Theories, without entring into minute Diſquiſitions into the ſeveral Varieties of Things, as is evident in the Two Caſes already alledged, *of Viſion* and *Muſcular Motion.*

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Now as this Method of Philoſophizing laid down above, is right, ſo it is eaſie to prove that it has been carefully followed by Modern Philoſophers. My Lord *Bacon* was the firſt great Man who took much pains to convince the World that they had hitherto been in a wrong Path, and that Nature her ſelf, rather than her Secretaries, was to be addreſſed to by thoſe who were deſirous to know very much of her Mind. Monſieur *Des Cartes*, who came ſoon after, did not perfectly tread in his Steps, ſince he was for doing moſt of his Work in his Cloſet, concluding too ſoon, before he had made Experiments enough; but then to a vaſt Genius he joined exquiſite Skill in Geometry, and working upon intelligible Principles in an intelligible Manner; though he very often failed of one Part of his End, namely, a right Explication of the Phænomena of Nature, yet by marrying Geometry and Phyſicks together, he put the World in Hopes of a Maſculine Off-ſpring in proceſs of Time, though the firſt Productions ſhould prove abortive. This was the State of Natural Philoſophy, when thoſe great Men who after King *Charles* II's Reſtoration joined in a Body, called by that Prince himſelf, the *ROYAL SOCIETY*, went on with the Deſign; they made it their Buſineſs

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ſineſs to ſet their Members awork to collect a perfect Hiſtory of Nature, in order to eſtabliſh thereupon a Body of Phyſicks; what has been done towards it by the Members of that illuſtrious Body will be evident by conſidering that *Boyle*, *Barrow*, *Newton*, *Huygens*, *Malpighius*, *Leeuwenhoek*, *Willoughby*, *Willis*, and Abundance more already named amongſt the great Advancers of real Learning, have belonged to it: If it ſhall be thought too tedious a Work to examine all their Writings, *Mr. Boyle*'s *Works*, any one good *Syſtem of the* Carteſian *Philoſophy*, Monſieur *Rohault*'s for Inſtance, or to comprehend all under one, a Book Intituled, *Philoſophia Vetus & Nova ad Uſum Scholæ accommodata*, may be conſulted, and then it will be evident enough of which Side the Verdict ought to be given; in the laſt Book eſpecially it is evident how very little the Ancients did in all Parts of Natural Philoſophy, and what a great Compaſs it at preſent takes, ſince it makes the Compariſon I all along appeal to.

Thus, it ſeems to me to be very evident, That the Ancients Knowledge in all Matters relating to *Mathematicks* and *Phyſicks* was incomparably inferiour to that of the Moderns. Theſe are Subjects,

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many of them at leaſt, which require great Intenſeneſs of Thought, great Strength and Clearneſs of Imagination, even only to underſtand them, how much more then to invent them? The Ancient *Orators*, who ſpoke ſo great things in Praiſe of *Eloquence*, who make it ſo very hard a thing to be an Orator, had little or no Notion of the Difficulty of theſe Sciences; the *Romans* eſpecially who deſpiſed what they did not underſtand, and who did not without ſome Indignation learn of a People whom themſelves had conquered. But if they could have conceived what a Force of Genius is required to invent ſuch Propoſitions as are to be found in the Writings of their own Mathematicians, and of the Modern Geometers and Philoſophers, they would ſoon have acknowledged that there was need of as great at leaſt, if not greater Strength of Parts and Application to do very conſiderable things in theſe Sciences as in their own admired Eloquence, which was never more artfully employed than in commending it ſelf: The Panegyricks which they made upon Geometry, were rather Marks of their Pedantry than of their Skill; *Plato* and *Pythagoras* admired them, and therefore they did ſo too, out of a blind Reverence to thoſe great Names. Otherwiſe amongſt

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amongſt thoſe numerous Commendations which are given to *Archimedes*, ſome would have been ſpent upon the many noble Theorems which he diſcovered, and not almoſt all upon the Engines wherewith he baffled *Marcellus* at the Siege of *Syracuſe*. The Propoſition, *That the Superficies of a Sphere is equal to the Area's of Four of its greateſt Circles*, which is one of the moſt wonderful Inventions that was ever found in Geometry, ſhews him to have been a much greater Man, than all that is ſaid of him by the *Roman*, or *Greek* Hiſtorians. Had experimental Philoſophy been anciently brought upon the Stage, had Geometry been ſolemnly and generally applied to the Mechaniſm of Nature, and not ſolely made uſe of to inſtruct Men in the Art of Reaſoning, and even that too, not very generally neither, the Moderns would not have had ſo great Reaſon to boaſt as now they have: For theſe are things which come under ocular Demonſtration, which do not depend upon the Fancies of Men for their Approbation, as Oratory and Poetry very often do. So that one may not only in general ſay that the Ancients are out-done by the Moderns in theſe Matters, but alſo aſſign moſt of the particulars, and determine the Proportion

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wherein and how far they have been exceeded, and ſhew the ſeveral Steps whereby this ſort of Learning has from Age to Age received Improvement; which ends Diſputes and ſatisfies the Underſtanding at once.

CHAP. XXVII.

Of the Philological Learning of the Moderns.

HItherto in the main I pleaſe my ſelf, that there cannot be much ſaid againſt what I have aſſerted, though I have all along taken Care not to ſpeak too poſitively, where I found that it was not an eaſie Thing to vindicate every Propoſition without entring into a Controverſy, which would bear plauſible things on both ſides, and ſo might be run out into a Multitude of Words, which in Matters of this kind are very tireſome. But there are other Parts of Learning ſtill behind, where the very offering to compare the Moderns to the Ancients may ſeem a Paradox; where the ſubject Matter is entirely ancient, and is chiefly, if not altogether contained in Books that were written

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written before the Ancient Learning ſuffered much Decay.

Under this Head *Philology* and *Divinity* may very properly be ranked. I place *Divinity* laſt to avoid Repetition, becauſe what I have to ſay concerning Modern *Philology* will ſtrengthen many things that may be urged in the Behalf of Modern *Divinity* as oppoſed to the Ancient.

In ſpeaking of the Extent and Excellency of the *Philological Learning* of the Moderns within theſe laſt 200 Years, I would not be miſ-underſtood. For the Queſtion is not whether any Modern Critick has underſtood *Plato* or *Ariſtotle*, *Homer* or *Pindar*, as well as they did themſelves, for that were ridiculous; but whether Modern Induſtry may not have been able to diſcover a great many Miſtakes in the Aſſertions of the Ancients about Matters not done in their own Times, but ſeveral Ages before they were born. For the Ancients did not live all in one Age, and though they appear all under one Denomination, and ſo as it were upon a Level, like things ſeen at a vaſt Diſtance, to us who are very remote from the youngeſt of them; yet, upon a nearer View, they will be found very remote each from the other; and ſo as liable to Miſtakes when they talk of Matters not

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tranſacted in their own Times, as we are when reaſon of Matters of Fact, which were acted in the Reign of *William the Conquerour*. Wherefore if one reflects upon the Alteration which Printing has introduced into the State of Learning, when every Book once printed becomes out of Danger of being loſt, or hurt by Copiers; and that Books may be compared, examined, and canvaſſed with much more Eaſe than they could before, it will not ſeem ridiculous to ſay, That *Joſeph Scaliger*, *Iſaac Caſaubon*, *Salmaſius*, *Henricus Valeſius*, *Selden*, *Uſher*, *Bochart*, and other Philologers of their Stamp, may have had a very comprehenſive View of Antiquity, ſuch a one as Strangers to thoſe Matters, can have no Idea of; nay a much greater than, taken altogether, any one of the Ancients themſelves ever had, or indeed, could have. *Demoſthenes* and *Ariſtophanes* knew the State of their own Times better than *Caſaubon* or *Salmaſius*: But it is a Queſtion whether *Boëthius* or *Sidonius Apollinaris* knew the State of *Demoſthenes*'s Time ſo well; yet theſe alſo are Ancients to us, and have left behind them Writings of a very eſtimable Value. Literary Commerce was anciently not ſo frequent as now it is, though the *Roman* Empire made it more eaſie than otherwiſe it could have been. In

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In *Eccleſiaſtical Antiquity* this can be more fully proved than it can in *Civil*; becauſe Monuments of that Kind are more numerous, and have been better preſerved. How widely were the *Greek* Writers many times miſtaken, when they gave an Account of the Affairs of the *Latin* Churches. And how very imperfect, many Times, were the Accounts which the *Weſtern* Churches had of Things of the greateſt Moment that had been determined in the *Eaſt?* Though the Council of *Nice* was Oecumenical, yet the *African* Churches knew ſo little of its Canons above Fifty Years after it was held, that the Biſhops of *Rome* impoſed Canons made in another Council, held ſeveral Years after, in another Place, upon them, as Canons made in the Council of *Nice:* Yet they were all, at that Time, under one common Government, and theſe Things were acknowledged by all Sides to be of Eternal Concernment. The ſame Negligence, if not greater, is diſcernable in Matters which were ſtudied, rather as Recreation and Diverſion, than as neceſſary Buſineſs. How many of the Ancients buſied themſelves about Examining into the Antiquities of ſeveral Nations, eſpecially after the *Old Teſtament* was tranſlated into *Greek?* Yet how few of

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of them underſtood the Languages of thoſe Countries of which they diſputed? There were but two of the Ancient Fathers, that we know of, that pretended to Learning, who underſtood *Hebrew* accurately; *Origen*, and St. *Hierom*: And how well St. *Hierom* underſtood it, is now certainly known; not like the *Lightfoot's*, the *Buxtorf's*, the *Druſius's*, and the *Cappell's* of the preſent Age, one may be very well aſſured: The other *Oriental* Languages, even theſe Inquiſitive Fathers knew very little, or nothing, of. To how good purpoſe they have been cultivated by the Moderns, the Writings of *Selden*, *Bochart*, *Pocock*, and ſeveral others, do abundantly declare. When *Pocock* and *Golius* went into the *Eaſt*, to bring away their Learning, *they* went to very good purpoſe indeed. The *Bodleyan* and *Leyden* Libraries can witneſs what vaſt Heaps of *Eaſtern MSS.* have been brought by ſuch Men as theſe, into *Europe*. One would think I were drawing up a Catalogue, not writing of a Letter, if I ſhould enumerate the Books which have been printed about the *Oriental* Learning, within theſe laſt Seventy Years: And how much they have enlightned all manner of Antiquity, is eaſie to tell.

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How clearly has the *Old Chronology* and *Geography* been ſtated by Modern Criticks and Philologers; and the Miſtakes and Careleſneſs of many Writers detected, who were eſteemed Authentick even in the Times wherein they lived? *Selden* and *Bochart*, to name no more at preſent, have plainly proved, that all the Ancient *Greek* Antiquaries were not near ſo well acquainted with the Originals of that *Mythology*, which then made up a good part of their Religion, as well as of their Learning, as it is known at preſent, ſince the Languages of thoſe Countries, from whence moſt of thoſe Rites and Stories took their Original, have been carefully examined, and critically ſtudied. Is it not a very odd Thing, that of ſo many as have written of the *Pyramids*, there ſhould not be one exact Account of them, Ancient nor Modern, till Mr. *Greaves* deſcribed them? They were admired formerly, as much as now (*d*); reckoned amongſt the Seven Wonders of the World; and mentioned, from *Herodotus*'s Time, downwards, by all that gave any Account of *Egypt*: Yet moſt Men copied after *Herodotus*; and many of the reſt, who did not, ſpoke by gueſs. None of the extant Ancient Authors was ſo exact as Sir *George Sandys*, who wanted

(d) *Barbara Pyramidum ſileat miracula Memphis.* Martial.

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ed nothing but Mathematical Skill, to have left nothing for Mr. *Greaves*, who came after him, to do. This is an eminent Inſtance, whereby we may give a certain Judgment of the Hiſtorical Exactneſs of the Ancients, compared to that of the Moderns. It may be improved to conſiderable Purpoſes; at leaſt, it is of great uſe to juſtifie thoſe Modern Writers, who have, with great Freedom, accuſed ſome of the Greateſt of the Ancients, of Careleſneſs in their Accounts of Civil Occurrencies, as well as of Natural Rareties; and who have dared to believe their own Reaſon, againſt the poſitive Evidence of an old Hiſtorian, in Matters wherein one would think that he had greater Opportunities of knowing the certain Truth, than any Man that has lived for ſeveral Ages.

But here I expect that it ſhould be objected, that this is not to be eſteemed as a Part of Real Learning. To pore in old *MSS.* to compare various Readings; to turn over *Gloſſaries*, and old *Scholia* upon Ancient Hiſtorians, Orators and Poets; to be minutely critical in all the little Faſhions of the Ancient *Greeks* and *Romans*, the Memory whereof was, in a manner, loſt within Fifty or an Hundred Years after they had been in uſe; may be good Argu-

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Arguments of a Man's Induſtry, and Willingneſs to drudge; but ſeem to ſignifie little to denominate him a great Genius, or one who was able to do great Things of himſelf. The Objection is ſpecious enough, and the Indiſcretions of many Modern Commentators have given but too much Colour for it; which has, in our Nation eſpecially, been riveted in Men's Minds, more, perhaps, than in any other learned Nation in *Europe:* Tho in Enquiries into the remoteſt Antiquities of the oldeſt Nations, perhaps no People have done near ſo much as ſome learned *Engliſh*-Men. But this Objection lies chiefly againſt the Men, not the Knowledge, the Extent whereof it is only my Buſineſs to enquire into; and yet, even there too, it is without Ground; for, whoever will be at the pains to reflect upon the vaſt Extent of the various Knowledge which ſuch Men as thoſe I named before had treaſured together, which they were able to produce to ſuch excellent Purpoſes in their Writings, muſt confeſs that their *Genius's* were little, if at all, inferiour to their *Memories*; thoſe among them eſpecially, who have buſied themſelves in reſtoring corrupted Places of Ancient Authors. There are Thouſands of Corrections and Cenſures upon Authors to be found

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found in the Annotations of Modern Criticks, which required more Fineneſs of Thought, and Happineſs of Invention, than, perhaps, Twenty ſuch Volumes as thoſe were, upon which theſe very Criticiſms were made. For, though, generally ſpeaking, good Copies are abſolutely neceſſary; though the Critick himſelf muſt have a perfect Command of the Language and particular Stile of his Author, muſt have a clear Idea of the Way and Humour of the Age in which he wrote; many of which Things require great Sagacity, as well as great Induſtry; yet there is a peculiar Quickneſs in Diſcerning what is proper to the Paſſage then to be corrected, in diſtinguiſhing all the particular Circumſtances neceſſary to be obſerved, and thoſe, perhaps, very numerous; which raiſe a judicious Critick very often as much above the Author upon whom he tries his Skill, as he that diſcerns another Man's Thoughts, is therein greater than he that thinks. And the Objection that is commonly made againſt Editors of old Books, That every Man cries up his own Author, beyond all that have ever wrote upon that Subject, or in that Way, will rarely hold of truly great Criticks, when they paſs their Judgments, and employ their Thoughts upon indif-

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indifferent Books; ſince ſome have taken as much Pains, in their Critical Annotations (*e*), to expoſe Authors who have had the good Luck to be exceedingly commended by learned Men, as ever others did to praiſe them.

(e) *Vide* Petri Cunæi *Animadverſiones in Nonni Dionyſiaca.*

Soon after Learning was reſtored, when Copies of Books, by Printing, were pretty well multiplied, *Criticiſm* began; which firſt was exerciſed in Setting out Correct Editions of Ancient Books; Men being forced to try to mend the Copies of Books, which they ſaw were ſo very negligently written. It ſoon became the Faſhionable Learning; and after *Eraſmus*, *Budæus*, *Beatus Rhenanus* and *Turnebus* had diſperſed that ſort of Knowledge through *England*, *France*, *Germany*, and the *Low-Countries*, which before had been kept altogether amongſt the *Italians*, it was, for about One Hundred and Twenty Years, cultivated with very great Care: And if ſince it has been at a Stand, it has not been becauſe the Parts of Men are ſunk; but becauſe the Subject is, in a manner, exhauſted; or, at leaſt, ſo far drained, that it requires more Labour, and a greater Force of Genius, now to gather good Gleanings, than formerly to bring home a plentiful Harveſt; and yet this Age has produced Men

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Men who, in the laſt, might have been reckoned with the *Scaligers*, and the *Lipſius's*. It is not very long ſince *Holſtenius*, *Bochart*, and *Gerhard Voſſius* died; but if they will not be allowed to have been of our Age, yet *Iſaac Voſſius*, *Nicholas Heinſius*, *Frederick Gronovius*, *Ezekiel Spanheym* and *Grævius* may come in; the two laſt of them are ſtill alive, and the others died but a few Years ſince. *England*, perhaps, cannot ſhew a proportionable Stock of Criticks of this Stamp. In *Henry* VIII's Time there was an admirable Set of Philologers in the Nation; though there is great difference to be made between a good Critick, and a Man that writes *Latin* as eaſily and correctly as his Mother-Tongue. Sir *Thomas More*, Cardinal *Poole*, *Linacre*, *Collet*, *Cheek*, *Aſcham*, and ſeveral more, often to be met with in *Eraſmus*'s *Epiſtles*, wrote *Latin* with a Purity that no *Italian* needed then to have been aſhamed of. Let the Subject they wrote have been what it would, one may ſee by the Purity of their Stile, that they wrote in a Language which expreſſed their Thoughts without Conſtraint. A great Familiarity with the politeſt Authors of Antiquity was what theſe Men valued themſelves much upon; and it was then the Delight of the Nation,

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as much as their Diſputes in Religion would give them Leave. Though this ſeemed to ſink by degrees, yet that afterwards Critical Skill in Antiquity was valued and purſued by our learned Men, will not be queſtioned by thoſe who conſider that Sir *Henry Savile*, Mr. *Cambden*, Archbiſhop *Uſher*, Mr. *Selden*, Sir *John Marſham*, Mr. *Gataker* (not to mention ſome now alive, whoſe Fame will one Day equal that of the *Scaligers* and the *Grotius's* of other Nations) were the Glories of our Country, as well as of the Age they lived in.

In ſhort, to conclude this Argument: Though Philological and Critical Learning has been generally accuſed of Pedantry, becauſe it has ſometimes been purſued by Men who ſeemed to value themſelves upon Abundance of Quotations of *Greek* and *Latin*, and a vain Oſtentation of diffuſed Reading, without any Thing elſe in their Writings to recommend them; yet the Difficulty that there is, to do any Thing conſiderable in it, joyned with the great Advantages which thereby have accrued to the Commonwealth of Learning, have made this no mean Head whereon to commend the great *Sagacity*, as well as *Induſtry* of theſe later Ages.

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CHAP. XXVIII.

Of the Theological Learning of the Moderns.

TO *Philology* I before added *Divinity*, and, as I hope to prove, not without Reaſon. As they relate to our Queſtion, they both agree in this, that the Subject of them both is truly Ancient; and that it is impoſſible to become very excellent in either of them, without a familiar Converſation with thoſe Original Books, to which the great Maſters of both theſe Sciences do conſtantly appeal. Our *Bleſſed Saviour* did not reveal his Law by Halves to his Apoſtles, nor is the *New Teſtament* an imperfect Rule of Faith: The *Old Teſtament* likewiſe has conſtantly been at hand; and the *Jews* have, ever ſince their Return from the *Babyloniſh* Captivity, been ſcrupulouſly ſollicitous to preſerve the *(f) Genuine Hebrew and Chaldee Text* of the *Old Teſtament*, pure and uncorrupted,

(f) Sir William Temple *queſtions*, p. 38. *whether we have any Thing more Ancient than the* Auguſtan *Age of the old* Hebrew *and* Chaldæan *Languages, that is* Genuine. *It may be ſaid, that he deſigned to except the* Old Teſtament; *which I believe he did: However, there being no Reſtriction in his Words, he himſelf muſt own that it is looſly expreſſed.*

to

to ſucceeding Ages. Yet, though theſe, together with the Writings of the *Greek* and *Latin* Fathers, be Inſtruments without which no Divine can work; and though it ſeems almoſt impoſſible that any Man ſhould be able to perform all the Duties of his Profeſſion, that are incumbent upon him as a Scholar, without a competent Exactneſs in all theſe Things; yet it is very poſſible that Modern Divines, who make uſe of theſe Inſtruments, may be better Work-men than thoſe Ancient Fathers, who furniſhed them with the greateſt part.

Now, that there may be no Diſputes about Terms miſ-underſtood, it will be neceſſary to explain what is here meant by *a perfect Divine*; that is to ſay, ſuch an one as may be a Standard whereon to found a Compariſon. *A perfect Divine* ought to underſtand the Text of the *Old* and *New Teſtament* ſo exactly, as to have a clear Notion of every Book in general, and of the Grammatical Meaning of every Text in particular; that ſo he may be able to reconcile all Difficulties, and anſwer all Objections that may ariſe: He ought to underſtand the State of the Church, as to its Doctrine and Diſcipline, in its ſeveral Ages: He ought to be thoroughly verſed in all the General Notions

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of *Ethicks*, taken in their utmoſt Extent, to enable him to reſolve ſuch Caſes of Conſcience as may occurr, with Judgment and Satisfaction; he ought to be a Maſter of all the Topicks of Perſwaſion which can ever lie in his Way, that ſo his Exhortations may pleaſe and convince thoſe whom he deſigns to perſwade at the ſame Time; laſt of all he ought to be able to anſwer all the Objections which may be, or have been raiſed againſt the Doctrine and Diſcipline of the Church, by its open or ſecret Enemies. Theſe ſeem to be the neceſſary Qualifications of a *Perfect Divine*; it may perhaps, be queſtioned whether any Man did ever fully come up to this Deſcription; neither is it neceſſary that any ſhould, ſince the Queſtion will be as perfectly anſwered by determining who have come the neareſt to it, as by aſſigning any particular Perſon that ever quite reach'd up to it. For theſe Differences do not lie in a Mathematical Point, and I do not deſire that any diſputable things ſhould ever be brought under Debate. One Qualification indeed, and that the greateſt of all, I have omitted; but that relates not to the preſent Controverſie, ſince we are not now enquiring who were the holieſt Men, but who have been the greateſt Maſters of

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of their Profeſſions, the ancient Fathers or the Modern Divines.

The firſt thing required, is an exact Knowledge of the Text of the Old Teſtament. Herein even the LXX Interpreters themſelves have often failed, as has been abundantly proved by Modern Criticks. The Copies they uſed were ſometimes faulty, and ſince they did not mend thoſe Faults, it is very probable they did not ſee them. It has been obſerved already, That ſcarce any of the Fathers underſtood *Hebrew* beſides *Origen* and St. *Hierom*, who therefore were followed as Oracles by many of their Succeſſors; even that alone will not ſuffice, becauſe there are no other Books written in that Language: For which Reaſon *Syriac*, *Chaldee*, *Samaritan* and *Arabic*, have been ſtudied by Modern Criticks; not to mention the Writings of the *Rabbins* and the *Talmudiſts*, to which the Ancients were utter Strangers. If we come to Particulars, who of the Ancients ever unravelled the Chronology of the Old Teſtament like Archbiſhop Uſher, and Sir *John Marſham?* Though *Euſebius*'s *Chronicon* is a ſtanding Evidence how much he, and *Julius Africanus* before him, endeavoured to clear that Matter, which was of ſo great Uſe to confound the

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vain Pretences to Antiquity of thoſe other Nations that were ſo very unwilling to yield to the *Jews* in this Particular. Who has ever given ſo rational and ſo intelligible an Account of the Deſign and Intent of the ſeveral parts of the ceremonial Law as Dr. *Spencer*? Who has acquainted the World with the Geography of *Geneſis*, or the Natural Hiſtory of the Bible, like Monſieur *Bochart*? Theſe are much harder things than the lengthning of a fine-ſpun Allegory, or than a few moral Reflections which conſtitute the greateſt part of the Ancient Comments. But the New Teſtament, you will ſay, was written in a Time that was nearer at Hand; and ſo was certainly better underſtood. Without doubt it was, by the Firſt Fathers; for which Reaſon their Interpretations (g) and their Reaſonings, if we could have recovered many of them would have been of infinite Value: But when once the Synagogue and the Church broke off all their Correſpondence, when once the immediate Reaſons of the firſt Eſtabliſhment of many Parts of the Chriſtian Diſcipline, and of great Numbers of Alluſions to *Jewiſh* Cuſtoms and Traditions which are to be found in the New Teſtament, could only be known by Study and Reading, all which the firſt Chriſtians

(g) *See Mr.* Dodwell's Two Firſt Diſſertations upon *S.* Irenæus.

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Chriſtians knew without Study, as we do the Manners and Faſhions of our own Age and Country, then the ancient Interpretations of the New Teſtament began to fail, and though ſome of them, S. *Chryſoſtom*'s and *Theodoret*'s eſpecially, are in themſelves, ſetting Antiquity aſide, truly valuable; yet, for want of ſuch a diffuſed Knowledge of Eaſtern Antiquities as was neceſſary, and which only could be had by a long Converſation with the Books that are written in thoſe Languages, theſe admirable Commentators ſeem in ſeveral Places not to have found out the true Original of many things in the New Teſtament which have been diſcovered ſince.

To the next Thing, which is Skill in *Eccleſiaſtical Antiquity*, I have ſpoken already. The *Third* and the *Fourth*, which relate to a Divine as a *Caſuiſt*, or as a *Preacher*, may be conſidered of together, wherein we of the preſent Age may, without Vanity, boaſt of having the beſt Books, and of them too the greateſt Numbers, upon theſe Subjects, written in our own Language, and by our own Countrymen, of any People in the World. The Excellency of a *Caſuiſt* is to give ſuch Reſolutions of Doubts and Queſtions propoſed to him, as may both ſuit with the

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particular Circumſtances of the Perſon who deſires Satisfaction; and alſo may be perfectly agreeable to the Law of God. *A Preacher* then ſeems to perform his Office beſt, when he can at once inſtruct and move his Auditors; can raiſe their Paſſions, and inform their Judgment: That ſo every Sermon upon a Doctrinal Head may contain the Solution of a Caſe of Conſcience. For the firſt of theſe; It is certain that many of the ableſt of the Ancient Fathers were very excellent Caſuiſts; as, indeed, every Man who has a right Judgment, an honeſt Mind, and a thorough Acquaintance with the Deſign of our *Bleſſed Saviour*, revealed in the Goſpel, muſt of neceſſity be. And if, at this diſtance, many of their Deciſions ſeem over-ſevere, there is as great, at leaſt, if not greater Reaſon to ſuſpect, that the Complaints now-a-days raiſed againſt them, may ariſe from our Degeneracy, as from their unwarrantable Strictneſs. But for the *Ancient* Way of *Preaching*, there is much more to be ſaid. The great Handle by which an Hearer is enabled to carry along with him a Preacher's Arguments, is, Method and Order. Herein the Ancient Homiliſts are very defective: Flights of Rhetorick, which are more or leſs judiciouſly applied, according

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cording to the Abilities of the ſeveral Preachers, make up the greateſt part of their Diſcourſes: And, after *Origen*, moſt Men buſied themſelves in giving the People Allegorical Interpretations of Paſſages of Scriptures, which were infinite, according to the Fancies of thoſe that uſed them. St. *Chryſoſtom*, indeed, reformed this Cuſtom in the *Greek* Church: His Authority went very far; and his Interpretations were almoſt always Literal, and, ſuitably to his vaſt Genius, very judicious. But he that conſiders Preaching as an Art capable of Rules and Improvement, will find a mighty Difference between a juſt, methodical Diſcourſe, built upon a proper Text of Scripture, wherein, after the Text is carefully explained, ſome one Duty or Doctrine of Religion, thence ariſing, is plainly proved by juſt and ſolid Arguments, from which ſuch Topicks of Perſuaſion are drawn at laſt, as are the moſt likely to raiſe ſuch an Affection, and engage thoſe Paſſions in the Minds of all the Auditors as will pleaſe and move good Men, and ſilence, at leaſt, if not perſuade the Bad; and between a looſe, paraphraſtical Explication of a large Portion of Scripture, which ends at laſt in a general Ethical Harangue, which is the uſual Method of moſt of St. *Chry-*

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St. *Chryſoſtom*'s Homilies. Whereas by the former Method, ſtrictly followed, very many of our *Engliſh* Sermons, eſpecially thoſe of the Great Men of our own Church, ſince the Reſtauration, are Solutions of the moſt difficult Queſtions in Divinity, and juſt Diſcourſes upon the ſeveral Duties of the Chriſtian Life; and this with ſo much Smoothneſs, ſo great Beauty of Language, and ſuch a juſt Application of the greateſt Ornaments of True and Maſculine Eloquence, to Things at firſt View very often the moſt oppoſite, that the Hearer takes a Pleaſure to think, that then he is moſt inſtructed, when he is beſt pleaſed. The Want of this Method in the Ancient Homiliſts, is the great Reaſon why they are ſo little read. It is not becauſe they are hard to be underſtood; for an indifferent Skill in *Greek* and *Latin* is ſufficient to go through with the greateſt part of them: But Want of Method, great Multiplicity of Words, and frequent Repetitions, tire out moſt Readers: They know not how far they are got, but by the Number of the Leaves; and ſo having no Reſt for their Minds to lean upon, when once they begin to be weary, they are

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ſoon diſguſted. If therefore theſe Inconveniences are, in a great Meaſure, avoided by Modern Preachers, their Sermons are, in their Kind, more perfect, though the Matter which both of them work upon be the ſame. And if theſe Things be the Effects of great Study, and of an exact Judgment, at leaſt in thoſe who contributed the moſt to ſo great an Alteration, then this alſo may come in as a proper Evidence of the Increaſe of Modern Learning; and with much more Reaſon than thoſe Things which only tend to divert a Man when he is unfit for ſerious Buſineſs. Who thoſe are who have ſucceeded the *Hookers*, the *Chillingworths*, the *Sanderſons*, and the *Hammonds* of this laſt Age, to ſuch excellent purpoſe for the preſent, and thoſe that ſhall come after, I need not name; but ſhall rather conclude with that Saying in *Velleius Paterculus*, upon a not much unlike Occaſion; *Virorum ut admiratio magna, ita cenſura difficilis eſt.*

The laſt Thing which I mentioned as neceſſary for a Divine, is, *To be able to anſwer ſuch Objections as have been, or may be raiſed againſt the Chriſtian Faith.* Of the Controverſies which have

have arisen among Christians, and the Adversaries with whom they have been obliged to engage, there are in the present Account two Sorts; those which the Ancient Fathers were concerned with, and those that appeared since. Of the Latter it may, possibly, seem hard to pass a Judgment, since one cannot well say how Men would have managed Disputes which never came in their Way. The former may also be sub-divided into those which have been renewed in our own Time; and those of which we have only the Memory in Ancient Books. So that one is rather to consider how Controversies were handled in general, and so inferr how these Modern ones would have been managed, had there been an Occasion, which have only engaged the Wits and Passions of later Ages.

It is evident, that in their first Disputes with the *Gentiles*, the old Apologists did, with great Accuracy, expose both the Follies of their Worship, and the Vanity of their Philosophy: They opened the Christian Religion with great Clearness; they shewed the Grounds of their Belief, and proved its Reasonableness upon such Principles as were both solid in themselves, and suitable

table to the Ways of Arguing, and the peculiar Notions of all their ſeveral Adverſaries. Afterwards, when the Myſteries of the Chriſtian Religion were ſo eagerly debated, in Ages wherein they feared no Foreign Force, they ſhewed as great Subtilty in their Arguments, and as great Dexterity in ſhifting off the Sophiſms of their Opponents, as have ever been ſhewed in later Times. So that thus far the Moderns ſeem to have little Advantage: And, indeed, the Books that were written in Defence of the Chriſtian Religion were very admirable: But in the Controverſies that were managed amongſt themſelves, there ſeem to be, many Times, as viſible Signs of too great a Subtilty, as of a judicious Underſtanding of the Point in hand: They uſed little Method in ranging their Arguments, and rarely ſtated the Queſtion in plain and ſhort Terms; which made them often multiply Words to a tedious Length, that both tired the Readers, and darkned the Diſpute. That all theſe Faults are too often found in the Polemical Diſcourſes of the Moderns, is moſt certain: But Compariſons are always laid between the ableſt Men of both Sides. The

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The Modern Defences of the Doctrines of the *Trinity*, and the *Incarnation*, may be compared with the old Defences of the same Doctrines against the *Arians*, and other Ancient Hereticks. If Hereticks may be compared with Hereticks, there is no Question but the *Socinians* are much abler Disputants than the *Arians* and *Eunomians* of old: They have collected every Thing that could look like an Argument; they have critically canvassed every Text of Scripture which anciently was not so Grammatically understood as now it is, and have spared no Pains nor Art to wrest every Thing that, with any Shew of Reason, could be drawn to their Side: They have refined upon the Philosophical Notions of God, and of his Attributes; and have taken great Care not to confound their Readers, or themselves, with Want of Method, or a Multiplicity of Words. Such able Adversaries have not failed of as able Opponents. And when Men of Skill manage any Dispute, whatsoever it be, they will teach one another the Art of Reasoning, even though before-hand they should not well have understood it; when their Debates continue to any Length.

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Length. Whence alſo it has followed, that though theſe Great Men, who have defended our Faith againſt ſuch ſubtile Adverſaries would have ſhewn their Skill equally upon any other Subject which they ſhould have undertook; yet upon theſe Queſtions, the Truth would otherwiſe have never been ſo perfectly known.

And here it ought to be obſerved, that the Art of making Controverſies eaſie and intelligible, even though the Arguments ſhould be all the ſame that had formerly been urged, ſhews much greater Skill, and a more thorough Underſtanding of thoſe Matters, than had been diſcovered before: For, he that makes another underſtand a Thing in few Words, has a more clear and comprehenſive Knowledge of that Thing, than another Man who uſes a great many. Such a Man's Excurſions, if he has a Mind at any Time to go out of the Way, or to enlarge, for the Eaſe of thoſe who love to have Things expreſſed in an Homilitical Manner, will never tire; becauſe, having his Point ſtill in view, he will take Care that his Readers or Auditors ſhall always know where he is. Hence it is, that there are many Sermons

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mons in our Language, upon the most abstruse Questions in the Christian Religion, wherein *English* Readers who never read Fathers nor School-men; whose Heads have never been filled with Terms of Art, and Distinctions many Times without a Difference, may both in few, and clear Propositions, know what they are to believe, and at the same Time know how to defend it. Hereby in all our *Controversies* with *Papists*, *Socinians*, and *Dissenters*, many admirable Discourses have been written, wherein one sees the Question rightly stated, presently brought to an Head, and accurately proved by such Arguments as its particular Nature may require. It cannot be denied, but a good deal of this Methodical Exactness was at first owing to the School-men; but they are Moderns here: And if their Writings have some Excellencies, which the elegant Composures of more learned Ages want, this also affords us a convincing Argument, that Mankind will, in something or other, be always improving; and that Men of working Heads, what Subject soever they handle, though they live in Times when they have none but barbarous Patterns to copy

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copy after, will do many things which politer People did not know, or elſe over-look'd.

Upon this Occaſion, I cannot but take Notice that the Moderns have made clearer and ſhorter Inſtitutions of all Manner of Arts and Sciences than any which the Ancients have left us. I have already inſtanced in the Method, whereto all the Parts of Natural Hiſtory have been reduced. It is evident, That Method in all thoſe things muſt be the Effect of a Comprehenſive Knowledge of the Bodies ſo ranged and of a nice Compariſon of every ſeveral Body and Animal one with another, ſince otherwiſe their mutual Differences and Agreements cannot poſſibly be adjuſted; the ſame has been done in Anatomy, in Chymiſtry, in all parts of Phyſicks and Mathematicks: How confuſed many Times, and always lax are *Galen*'s Anatomical Diſcourſes in Compariſon of *Bartholin*'s, *Diemerbroeck*'s and *Gibſon*'s? Monſieur *Perrault* has obſerved already *(h)* that *Ariſtotle* expreſſed himſelf ſo obſcurely in his *Phyſical Diſcourſes*, that his Meaning is almoſt as variouſly repreſented as there have been Commen-

(h) Paralele des Anciens & des Modernes, Dialog. III. Pag. 251 — 257.

tators who have written upon him; whereas no Man ever doubted of the precise meaning of the Writings of *Des Cartes* and *Rohault*, though all Men are not of their Opinion. In Mathematicks the thing is yet more visible; how long and tedious are *Euclid*'s *Demonstrations*, either in *Greek*, or as they are commented upon by *Clavius*, in Comparison of *Tacquet*'s or *Barrow*'s? *Tacquet* has made *Astronomy* intelligible with a very little Help; which before was not to be attained without a Master, and a World of Patience; the same has *Varenius* done in the *Mathematical Part of Geography*, *Tacquet* in *Practical Geometry*, *Opticks*, *and Catoptricks*. The *Doctrine* of the *Conic Sections* in *Apollonius Pergæus* is so intricate, the Demonstrations are so long and so perplexed, that they have always deterred all but First-Rate Geometers: This Pensioner *De Witte*, has made so easie in his *Elements* of *Curve Lines* (i), that it is readily mastered by any Man who has read the First Six Books of *Euclid*. Such Abridgments save Abundance of Labour, and make Knowledge pleasant to those, who in the last Age were so exceedingly frightned with the

(i) *Annexed to the last Editions of* Des Cartes's *Geometry.*

Thoughts

Thoughts of the Difficulty of these Studies, that Sir *Henry Savile* made as formal a Business of his *Prelections upon the Definitions, Axioms, and* VIII *First Propositions of the First Book of* Euclid, which may be thoroughly comprehended by a Man of ordinary Parts in Two Hours Time, by the Help of *Tacquet*'s *Elements*, as a Man would now of Lectures upon the hardest Propositions, in Mr. *Newton*'s *Mathematical Principles of Natural Philosophy*. To these judicious Abridgements the wonderful Increase of this Part of Knowledge, for these last LXX Years is in a great Measure to be attributed; and though Methodizers and Compilers of Systems have very often the hard Fate to be undervalued by those who have been Inventors themselves; yet, in Mathematical Sciences the Case is something different; for things cannot be abbreviated here, without an almost intuitive Knowledge of the Subjects then to be abridged, and brought into one View. In *Moral*, or *Historical Discourses*, an Epitomizer immediately sees what is either in its self superfluous, or not to his particular Purpose; and so when he has cut it off, what remains is in

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ſome ſort intire, and may be underſtood without the reſt, ſo that there is no Harm done: But here that will by no means ſuffice, for the moſt verboſe Mathematicians rarely ever ſaid any thing for ſaying Sake, theirs being Subjects in which Figures of Rhetorick could have no ſort of Place, but they made every Concluſion depend upon ſuch a Chain of Premiſes already proved, that if one Link were broke, the whole Chain fell in Pieces; and therefore, he that would reduce thoſe Demonſtrations into a narrower Compaſs, muſt take the whole Propoſition a new in Pieces, muſt turn it ſeveral Ways, muſt conſider all the Relations which that Line, or that Solid has to other Lines or Solids, muſt carefully have conſidered how many ſeveral Ways it can be generated, before he can be able to demonſtrate it by a ſhorter Method, and by other Arguments, than thoſe by which it was proved before; in ſhort, he muſt in a Manner be able to invent the Propoſition of himſelf, before he can put it into this new Dreſs; for which Reaſon, *Tacquet*, *Barrow*, and *De Witte*, have been reckoned amongſt the Principal Geometers of the Age,

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Age, as well as for their other Inventions in Geometry. *Tſchirnhaus*'s *Medicina Mentis* will give a clear Idea of many things relating to this Matter:

And now, having gone through the ſeveral Parts of the Parallel which I propoſed at firſt to make, I ſhall cloſe all with Sir *William Temple*'s Words a little altered. *(k)* 'Though *Thales*, *Pythagoras*, *Democritus*, *Hippocrates*, *Plato*, *Ariſtotle* and *Epicurus*, may be reckoned amongſt the Firſt mighty Conquerours of Ignorance, in our World; 'and though they made great Progreſſes in the ſeveral Empires of Science, 'yet not ſo great in very many Parts, 'as their Succeſſors have ſince been able to reach. Theſe have pretended 'to much more, than barely to learn 'what the others taught, or to remember what they invented; and being 'able to compaſs that it ſelf, have ſet 'up for Authors upon their own Stocks, 'and not contenting themſelves only 'with commenting upon thoſe Texts, 'have both copied after former Originals already ſet them, and have added 'Originals of their own in many things 'of a much greater Value."

(k) Pag. 30.

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CHAP. XXIX.

Reflections upon the Reasons of the Decay of Modern Learning, assigned by Sir William Temple.

HAving therefore, as I hope, sufficiently proved that there has not been such a Fall in Modern Learning, as Sir *William Temple* supposes; nay, even that comparatively speaking the Extent of Knowlege, is at this Time, vastly greater than it was in former Ages, it may seem, perhaps, a needless Thing to examine those Reasons which he alledges, of the Decrease of that which in the gross has suffered no Decay. Something however, I shall say to them, because if they do not prove what Sir *William Temple* designs, yet they will prove at least, what a perfect thing Learning might have been, if it had not met with such Impediments.

(l) Pag. 64, 65. The first Blow which he says *(l)*, that Learning received, was by the Disputes which arise about Religion in *Europe*, soon

ſoon after the Revival of Learning in theſe parts of the World. There is no doubt, but the Thoughts of many very able Men were taken up with thoſe Controverſies; who, if they had turned them with the ſame Application to natural or civil Knowledge, would therein have done very extraordinary things. Yet, conſidering all things, it may be juſtly queſtioned, whether Learning may not by theſe very Diſputes, have received either immediately, or occaſionally, a very great Improvement, or at leaſt, ſuffered no very conſiderable Diminution. For, (1.) it is certain, That whatſoever relates to Divinity as a Science, has hereby been better ſcanned, and more accurately underſtood and explained than otherwiſe it would ever have been; and, I ſuppoſe, this will be readily owned to be one of the moſt excellent Parts of Knowledge. (2.) It is a Queſtion, whether very many of the greateſt Promoters of any Part of this Theological Knowledge, would, or could have done ſo great things, upon any other Subject. Oppoſition in general, whets Mens Parts extremely, and that inward Satisfaction which a good Man takes, in thinking that he is em-

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ployed upon Arguments of greateſt Concern to the Souls of Men, inſpires him with an Ardour that adds Wings to his native Alacrity; and makes him in all ſuch Caſes, even out-do himſelf. (3.) When different Parties are once formed, and great Numbers of Youths are conſtantly trained up to ſucceed the older Champions of their reſpective Sides; as they ſhall drop off, all of them will not apply their Minds to Studies, immediately relating to their own Profeſſions, but here and there one, as his Genius ſhall lead him, will try to excel in different Ways for the Glory of his own Party; eſpecially if he ſees any of his Adverſaries eminently famous before him, in thoſe things. Thus *Petavius* ſet himſelf to contradict *Joſeph Scaliger*'s Books *De Emendatione Temporum*, and *Scioppius* fell upon his other Critical Writings. Whilſt *Iſaac Caſaubon* concerned himſelf only with publiſhing and Commenting upon *Athenæus*, *Polybius*, and *Theophraſtus*: He was complemented by all Sides, but when once he wrote againſt the Annals of Cardinal *Baronius*, he met with numerous Adverſaries; and there was ſcarce a Critick of the Church of

Rome

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Rome that wrote for ſome Time afterwards, that did not peck at ſomething or other in his other Writings. This Emulation eminently appeared in the Order of the Jeſuits, the main Deſign of whoſe Inſtitution ſeems to have been to engroſs all Learning, as well as all Politicks, to themſelves; and therefore, we ſee ſo many extraordinary Men amongſt them for all ſorts of things, thereby to give the World Occaſion to think, that there muſt certainly be ſomething more than ordinary in the Conſtitution of a Body, which every Day produced ſuch excellent Perſons. So that if one conſiders how far this Emulation went, which even yet is not wholly extinct, it is hard to ſay, whether Diſputes in Religion have not rather helped to encreaſe the Stock of Learning than otherwiſe; at leaſt, one may venture to ſay that they have not diminiſhed it.

It is moſt certain, that the different Political Intereſts in *Europe*, have done it a mighty Kindneſs. During the Eſtabliſhment of the *Roman* Empire, one common Intereſt guided that vaſt Body, and theſe Weſtern Kingdoms amongſt the reſt. *Rome* was the Center

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ter of their Learning of the Weſt, as well as of their Hopes, and thither the Provinces of this Part of the World had always Reſort: Whereas now every Kingdom ſtanding upon its own Bottom, they are all mutually jealous of each others Glory, and in nothing more than in Matters of Learning in thoſe Countries, where they have Opportunities to purſue it. About an Hundred and Fifty, or Two Hundred Years ſince, it was eſteemed a very honourable Thing to write a true *Ciceronian* Style: This the *Italians* pretended to keep to themſelves, and they would ſcarce allow that any Man beyond the *Alpes*, unleſs perhaps, *Longolius* and Cardinal *Pole*, wrote pure *Roman* Latin: This made other Nations ſtrive to equal them, and one rarely meets with a Book written at that Time upon a Subject that would bear the Elegancies of Stile in bad Latin: When *Critical Learning* was in Faſhion, every Nation had ſome few great Men at the ſame Time, or very near it, to ſet againſt thoſe of another. *Italy* boaſted of *Robertus Titius*, and *Petrus Victorius*; *France* had *Joſeph Scaliger*, *Iſaac Caſaubon*, *Cujacius*, *Pithæus*, *Briſſonius*,

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ſonius, and ſeveral more. *Switzerland* produced *Geſner*, for that and almoſt every thing elſe; *Germany* had *Leopardus*, *Gruter*, *Putſchius*, and others; the Low Countries had *Juſtus Lipſius*; *England* had Sir *Henry Savile*, every Country had ſome great Men to keep up its Glory in thoſe things which then were in greateſt requeſt. In this laſt Age *Mathematical* and *Phyſical* Sciences ſeem to have been the Darling Studies of the Learned Men of *Europe*; there alſo the ſame Emulation has been equally viſible. When Great *Britain* could ſhew ſuch Men as my Lord *Bacon*, my Lord *Napier*, the Inventor of Logarithms, Mr. *Harriot*, Mr. *Oughtred*, and Mr. *Horrox*; *Holland* had *Stevinus*, who firſt found out Decimal Arithmetick, and *Snellius*; *France* could reckon up *Des Cartes*, *Merſennus*, *Fermat*, and *Gaſſendi*; *Italy* had *Galileo*, *Torricellius*, and *Cavallerius*; *Germany*, *Kepler*; and *Denmark*, not long before, *Tycho Brahe*. When afterwards the Philoſophers of *England* grew numerous, and united their Strength, *France* alſo took the Hint, and its King ſet up a *Royal Society*, to Rival ours. The Duke of *Tuſcany* had ſet up already

ready at *Florence* the *Academy del Cimento*, whoſe Members employed themſelves in purſuing the ſame Methods. In *Germany*, an *Academy* of the ſame Nature has been raiſed. Even *Ireland* has had its *Philoſophical Society*. From all which, ſuch Swarms of Great Men in every Part of Natural and Mathematical Knowledge have within theſe few Years appeared, that it may, perhaps, without Vanity, be believed, that if this Humour laſts much longer, and learned Men do not divert their Thoughts to Speculations of another Kind, the next Age will not find very much Work of this Kind to do: For this ſort of Learning has ſpread whereever Letters have had any Encouragement in *Europe* ſo ſucceſsfully, that even the Northern Kingdoms have had their *Bartholin's*, their *Borrichius's*, their *Rudbeck's*, their *Wormius's*, and their *Hevelius's*, who have put in for that Prize which the Inhabitants of warmer Climates ſeemed already in poſſeſſion of. This has occaſioned the Writing of Abundance of Books, to vindicate the Glory of every great Invention to ſome eminent Man of that Country that the Authors of thoſe Books

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Books belonged to. Which Diſputes, though many Times very pedantically managed, and with an Heat miſ-becoming Learned Men, yet has had this good Effect, that while ſome were zealous to ſecure the Glory of the Invention of Things already diſcovered, to their own Countries; others were equally ſollicitous to add a more undiſputed Honour to them, by new Inventions, which they were ſure no Man could poſſibly challenge.

Another Reaſon of the Decay of Learning, according to Sir *William Temple* (*m*), is, the Want of Protection from Great Men, and an unſatiable Thirſt after Gain, now grown the Humour of the Age. That Princes do not now delight to talk of Matters of Learning in their publick Converſations, as they did about an Hundred and Fifty Years ago, is very evident. When Learning firſt came up, Men fanſied that every Thing could be done by it, and they were charmed with the Eloquence of its Profeſſors, who did not fail to ſet forth all its Advantages in the moſt engaging Dreſs. It was ſo very modiſh, that the fair Sex ſeemed to believe that *Greek*

(m) Pag. 67--71.

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Greek and *Latin* added to their Charms; and *Plato* and *Ariſtotle* untranſlated, were frequent Ornaments of their Cloſets. One would think by the Effects, that it was a proper Way of Educating of them, ſince there are no Accounts in Hiſtory of ſo many very great Women in any one Age, as are to be found between the Years 15 and 1600. This Humour in both Sexes abated by Degrees; and the Great Men being either diſguſted with the Labour that was requiſite to become thoroughly Learned, or with the frequent Repetitions of the ſame Things, Buſineſs and Diverſions took up their Thoughts, as they had done formerly. But yet, in the main, the Learned Men of this Age have not ſo very much Reaſon to think themſelves ill uſed, as it is commonly thought. What by Fellowſhips of Colleges, and Eccleſiaſtical Preferments, here in *England*; and by the ſame ſort of Preferments, added to the Allowances in ſeveral Monaſtical Orders, in Popiſh Countries, there are very fair Settlements for Men of Studious and Sedentary Lives; and innumerable Inſtances can be given in theſe two laſt Ages, of the excellent Uſes which

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which very many Men have made of them: So that every ſuch Preferment beſtowed upon any learned Man, upon the Score of his Merit, by Princes, or Great Men, in whoſe Gift they were, is an Inſtance of their Beneficence to Men of Letters: And whether a Man is conſidered by a Penſion out of a Prince's Exchequer, or by the Collation of a Preferment in that Prince's Gift, it is to the Man who enjoys it the ſelf-ſame Thing. Neither have Examples been wanting in the preſent Age, of Sovereign Princes who have made it as much their Buſineſs to encourage Learned Men, as, perhaps, in any of the former, that are ſo much commended for that very Reaſon. *Chriſtina* Queen of *Sweden*, who in other Reſpects, was by no Means the Glory of her Sex, did, whilſt ſhe lived at *Stockholm*, ſend for the learnedeſt Men of *Europe* to come to her, that ſhe might converſe with them about thoſe Things wherein they were moſt excellent. *Des Cartes*, *Salmaſius*, *Bochart*, *Nich. Heinſius*, *Iſaac Voſſius*, were of that Number: And her Profuſeneſs, which knew no Bounds, was never more viſible, than in her Marks of Reſpect

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Reſpect to Men of Letters. Afterwards, when ſhe ſetled at *Rome*, her Palace was always an Academy of the *Virtuoſi* of that City. The preſent *French* King, whilſt Monſieur *Colbert* lived, took a ſingular Pride in ſending Preſents to the moſt celebrated Scholars of *Europe*; without regarding whether they were his own Subjects, or of his own Religion, or no. This he did purely *for his Glory*, the Principle which Sir *William Temple* (*n*) ſo very much applauds. His own Proteſtant Subjects, before he involved them in one common Ruin, taſted of his Liberality of that Kind upon Occaſion: And whatſoever his other Actions are, and have been; yet his extraordinary Care to breed up his Son to Learning, his erecting of Academies for Arts and Sciences at *Paris*, and his frequent Bounties to Men of Letters, juſtly require that, upon this Account, he ſhould be mentioned with Honour. Cardinal *de Richelieu*, Cardinal *Mazarini*, Monſieur *Fouquet*, and Monſieur *Colbert*, though no Sovereign Princes, yet had Purſes greater than many of them. Cardinal *de Richelieu* was himſelf a Scholar; and all of them were eminently

(n) Pag. 68.

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eminently Favourers of Learned Men. I have mentioned my own Country laſt, that I might once more obſerve, that it was a Prince of our own, who founded the *ROYAL SOCIETY*, *(o) whoſe Studies, Writings and Productions, though they have not out-ſhined or eclipſed the* Lycæum *of* Plato, *the* Academy *of* Ariſtotle, *the* Stoa *of* Zeno, *or the* Garden *of* Epicurus, becauſe they were neither written at the ſame Time, nor, for the moſt part, upon the ſame Subjects; yet will always help to keep alive the Memory of that Prince, who incorporated them into a Body, that ſo they might the eaſier do that by their Joint-Labours, which ſingly would have been, in a manner, impoſſible to be effected. (o) Pag. 57.

The laſt of Sir *William Temple*'s Reaſons of the great Decay of Modern Learning (*p*) is *Pedantry*; the urging of which is an evident Argument, that his Diſcourſe is levelled againſt Learning, not as it ſtands now, but as it was Fifty or Sixty Years ago. For the new Philoſophy has introduced ſo great a Correſpondence between Men of Learning and Men of Buſineſs; which has alſo been en- (p) Pag. 71.

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creaſed by other Accidents amongſt the Maſters of other learned Profeſſions, that that *Pedantry* which formerly was almoſt univerſal, is now in a great Meaſure diſ-uſed; eſpecially, amongſt the young Men, who are taught in the Univerſities to laugh at that frequent Citation of Scraps of Latin, in common Diſcourſe, or upon Arguments that do not require it; and that nauſeous Oſtentation of Reading, and Scholarſhip in publick Companies, which formerly was ſo much in Faſhion. Affecting to write politely in Modern Languages, eſpecially the *French* and ours, has alſo helped very much to leſſen it, becauſe it has enabled Abundance of Men who want Academical Education to talk plauſibly, and ſome exactly, upon very many learned Subjects. This alſo, has made Writers habitually careful to avoid thoſe Impertinences which they know would be taken notice of and ridiculed; and it is probable, that a careful peruſal of the fine new *French* Books, which of late Years have been greedily ſought after by the politer ſort of Gentlemen and Scholars, may in this particular, have done Abundance of good. By this means, and by

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by the Help alſo of ſome other concurrent Cauſes, thoſe who were not learned themſelves being able to maintain Diſputes with thoſe that were, forced them to talk more warily, and brought them by little and little to be out of Countenance at that vain thruſting of their Learning into every thing, which before had been but too viſible.

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Conclusion.

THis ſeems to me to be the preſent State of Learning, as it may be compared with what it was in Former Ages: Whether Knowledge will improve in the next Age, proportionably, as it has done in this, is a Queſtion not eaſily decided. It depends upon a great many Circumſtances; which ſingly, will be ineffectual, and, which no Man can now be aſſured, will ever meet. There ſeems Reaſon indeed, to fear, that it may decay, both becauſe ancient Learning is too much ſtudied in Modern Books, and taken upon truſt by Modern Writers, who are not enough acquainted with Antiquity to correct their own miſtakes; and becauſe Natural and Mathematical Knowledge, wherein chiefly the Moderns are to be ſtudied as Originals, begin to be neglected by the Generality of thoſe who would ſet up for Scholars. For the Humour of the Age,

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as to thoſe things, is viſibly altered from what it was Twenty or Thirty Years ago; So that though the *ROYAL SOCIETY* has weathered the rude Attacks of ſuch ſort of Adverſaries as *Stubbe*, who endeavoured to have it thought, That Studying of Natural Philoſophy and Mathematicks, was a ready Method to introduce Scepticiſm at leaſt, if not Atheiſm into the World: Yet the ſly Inſinuations of the *Men of Wit*, That no great things have ever, or are ever like to be performed by the *Men of Greſham*, and, That every Man whom they call a *Virtuoſo*, muſt needs be a *Sir Nicholas Gim-crack*, have ſo far taken off the Edge of thoſe who have opulent Fortunes, and a Love to Learning, that Phyſiological Studies begin to be contracted amongſt Phyſicians and Mechanicks. The Truth is, one muſt ſpend a good deal of Time and Pains, of Induſtry and Attention, before he will be able thoroughly to reliſh them: And thoſe who do not, rarely know their Worth, and conſequently do very ſeldom paſs a right Judgment upon them: For which Reaſon, when the preſent Sett of Philoſophers are gone off, it is a great Queſtion, whether a new

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new one will ſucceed, that may equal them. Their Writings, however, will be preſerved, and as our Age has raiſed a nobler Monument to the Memory of *Archimedes* and *Diophantus*, of *Hippocrates* and *Ariſtotle*, of *Herophilus* and *Galen*, by improving of their Inventions, than had been raiſed for a Thouſand Years before; ſo ſome future Age, though, perhaps, not the next, and in a Country, now poſſibly little thought of, may do that which our great Men would be glad to ſee done; that is to ſay, they may raiſe real Knowledge, upon the Foundations laid in this our Age, to the utmoſt poſſible Perfection, to which it can be brought by mortal Men in this imperfect State.

But this is what one would gladly hope ſhould be reſerved for his own Poſterity, and his own Country; how it may be reſerved is obvious: It muſt be by joining Ancient and Modern Learning together, and by ſtudying each as Originals, in thoſe things wherein they ſeverally do moſt excel; by that means few Miſtakes will be committed, the World will ſoon ſee what remains unfiniſh'd, and Men will furniſh themſelves

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ſelves with fitting Methods to compleat it: And by doing Juſtice to every Side, they will have Reaſon to expect, that thoſe that come after them will do the ſame Juſtice to them, whenever they ſhall think fit to ſubmit their Productions to publick Cenſure.

FINIS.

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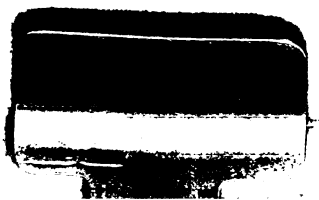

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